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Takizawa

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(54) **ELECTRIC POWER CONTROL SYSTEM AND ELECTRIC POWER CONTROL APPARATUS**

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B41J 2/00 (2006.01)
G05F 1/66 (2006.01)
B41J 29/38 (2006.01)

(52) **U.S. Cl.**

CPC .. ***G05F 1/66*** (2013.01); ***B41J 29/38*** (2013.01)

(58) **Field of Classification Search**

USPC 347/2, 5, 14, 16, 19, 110
See application file for complete search history.

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(57) **ABSTRACT**

An electric power control system includes a first device, a second device, and an electric power control apparatus. The first device performs an operation when electric power is supplied via a first plug socket. The second device performs an operation when electric power is supplied via a second plug socket. The first and second devices communicate with each other. The electric power control apparatus controls the electric power supplied to the first device and the second device. The first device includes a notification unit to notify the electric power control apparatus of information indicating the second device that is a device relating to the first device. The electric power control apparatus includes an electric power control unit to stop supplying electric power to the second device based on the information notified from the notification unit when the electric power control unit stops supplying electric power to the first device.

12 Claims, 13 Drawing Sheets

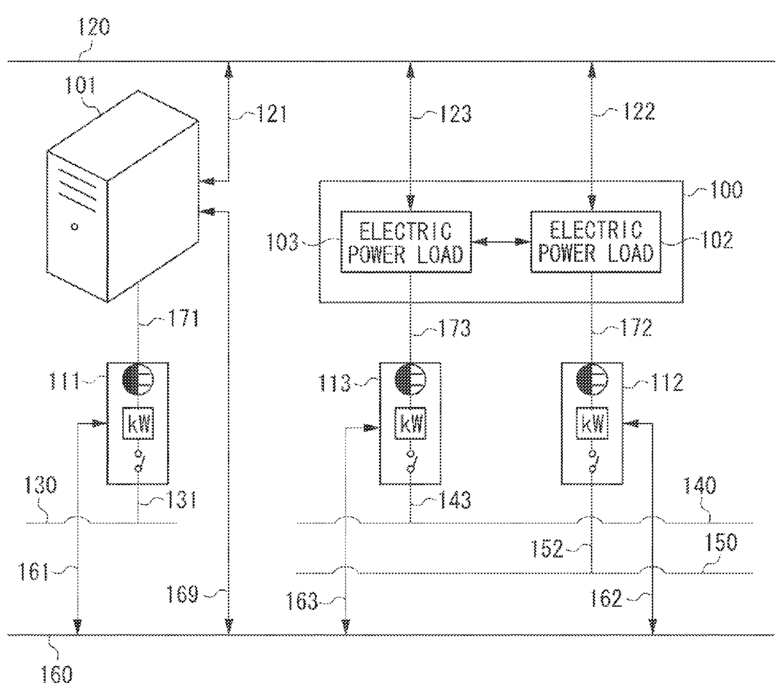
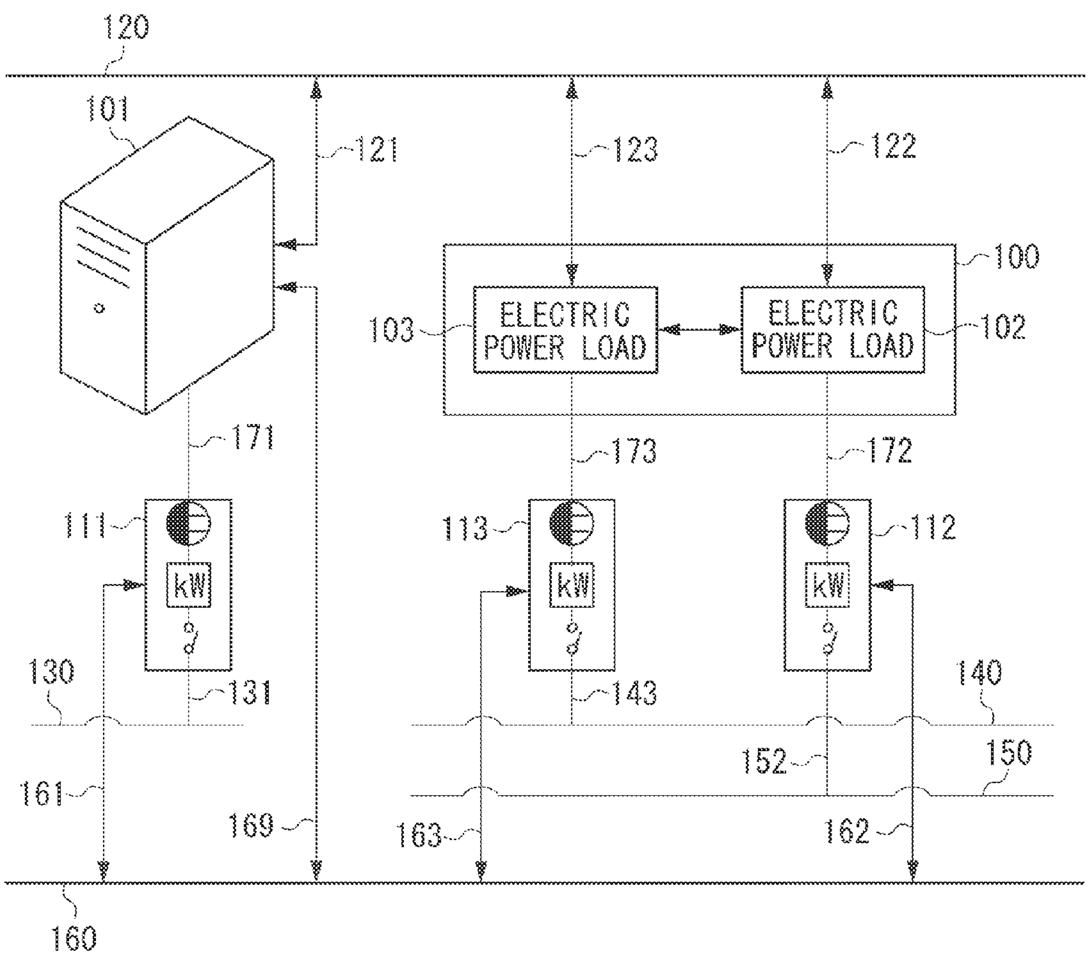


FIG. 1


120
101
121
123
122
100
103
ELECTRIC POWER LOAD
ELECTRIC POWER LOAD
102
171
173
172
111
113
112
kW
kW
kW
130
131
143
140
152
150
161
169
163
162
160

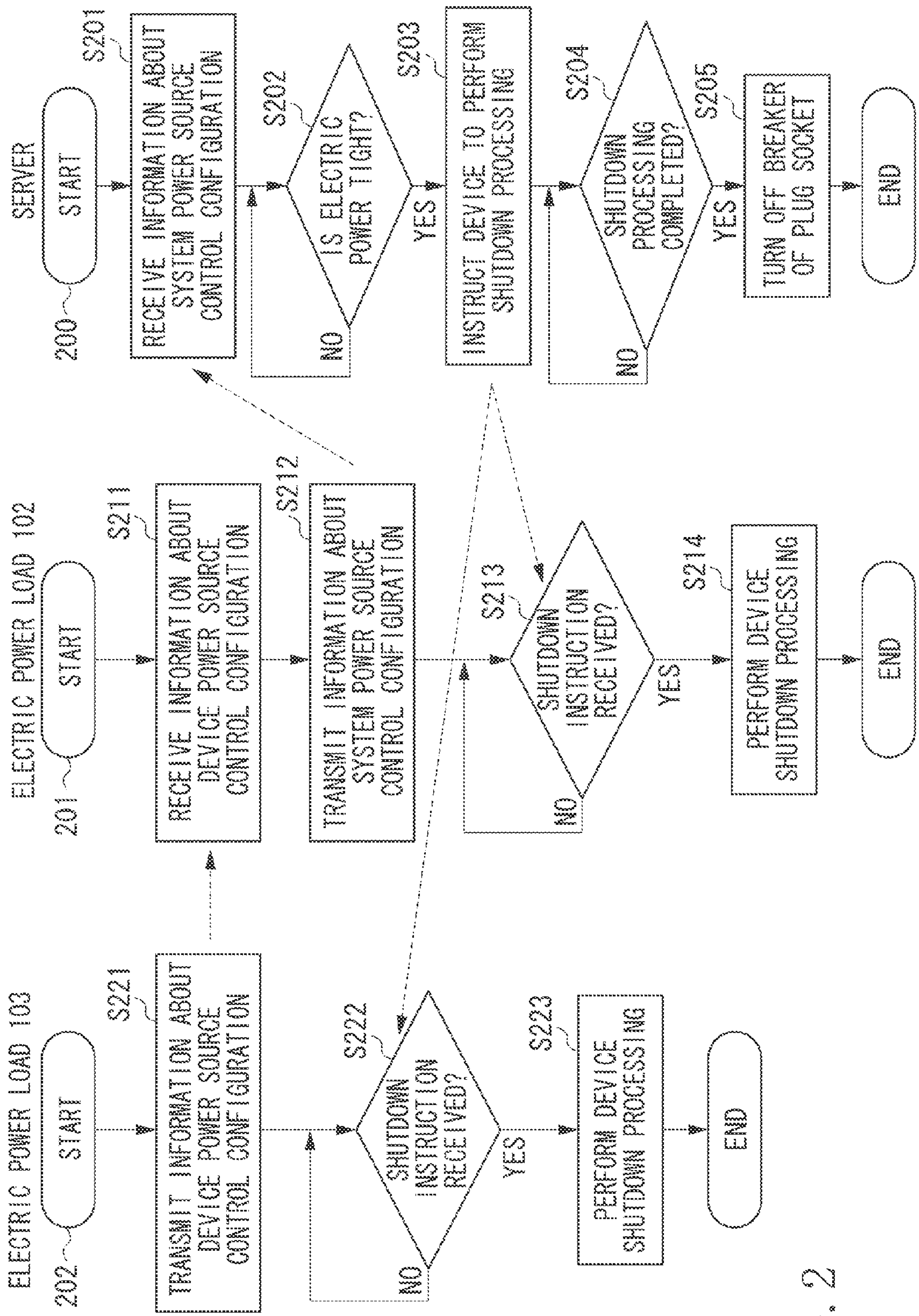

SERVER
200
START
S201
RECEIVE INFORMATION ABOUT SYSTEM POWER SOURCE CONTROL CONFIGURATION
S202
IS ELECTRIC POWER TIGHT?
NO
YES
S203
INSTRUCT DEVICE TO PERFORM SHUTDOWN PROCESSING
S204
SHUTDOWN PROCESSING COMPLETED?
NO
YES
S205
TURN OFF BREAKER OF PLUG SOCKET
END
ELECTRIC POWER LOAD 102
201
START
S211
RECEIVE INFORMATION ABOUT DEVICE POWER SOURCE CONTROL CONFIGURATION
S212
TRANSMIT INFORMATION ABOUT SYSTEM POWER SOURCE CONTROL CONFIGURATION
S213
SHUTDOWN INSTRUCTION RECEIVED?
NO
YES
S214
PERFORM DEVICE SHUTDOWN PROCESSING
END
ELECTRIC POWER LOAD 103
202
START
S221
TRANSMIT INFORMATION ABOUT DEVICE POWER SOURCE CONTROL CONFIGURATION
S222
SHUTDOWN INSTRUCTION RECEIVED?
NO
YES
S223
PERFORM DEVICE SHUTDOWN PROCESSING
END

FIG. 2

FIG. 3

301	302	303	304	305	306	307
DEVICE NAME	POWER SOURCE SYSTEM	PLUG SOCKET ID	IP ADDRESS OF ELECTRIC POWER METER	IP ADDRESS OF DEVICE	IP ADDRESS OF POWER SOURCE SET	SHUTDOWN COMPLETION WAITING INSTRUCTION
ELECTRIC POWER CONTROL SERVER 101	POWER LINE 130	1F_roomA_301	192.168.12.1	192.168.1.1	–	WAIT
ELECTRIC POWER LOAD 1 102	POWER LINE 150	1F_roomA_504	192.168.12.37	192.168.1.15	310 192.168.1.16	WAIT
ELECTRIC POWER LOAD 2 103	POWER LINE 140	1F_roomA_413	192.168.12.230	192.168.1.16	192.168.1.15	DO NOT WAIT

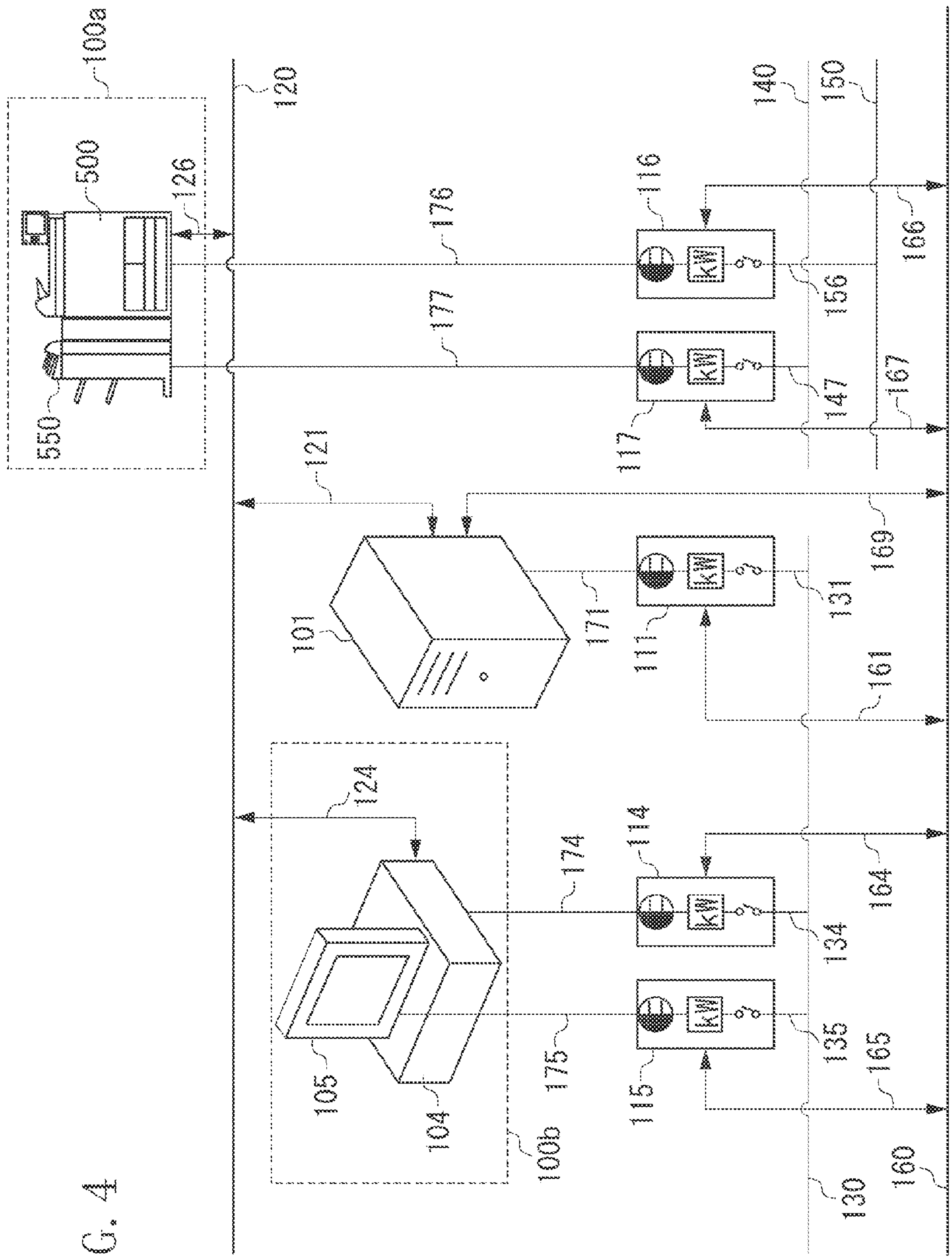

100a
120
500
126
550
176
177
140
150
116
156
166
117
147
167
121
169
101
171
111
131
161
124
114
174
164
134
105
175
135
165
115
104
100b
130
160
kW

FIG. 4

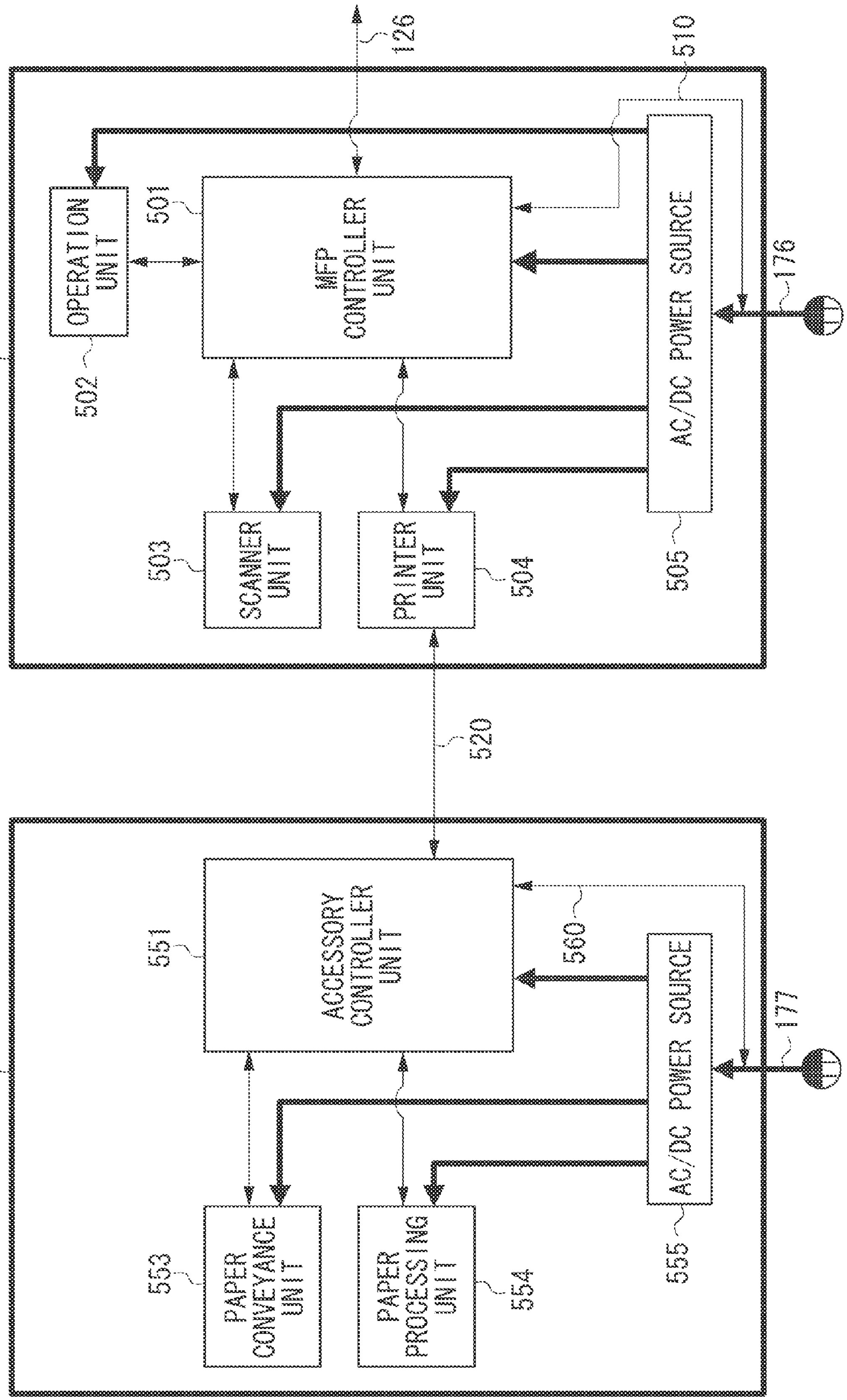

126
510
500
OPERATION UNIT
501
MFP CONTROLLER UNIT
502
AC/DC POWER SOURCE
176
503
SCANNER UNIT
PRINTER UNIT
504
505
520
550
551
ACCESSORY CONTROLLER UNIT
560
AC/DC POWER SOURCE
177
553
PAPER CONVEYANCE UNIT
PAPER PROCESSING UNIT
554
555

FIG. 5

FIG. 6

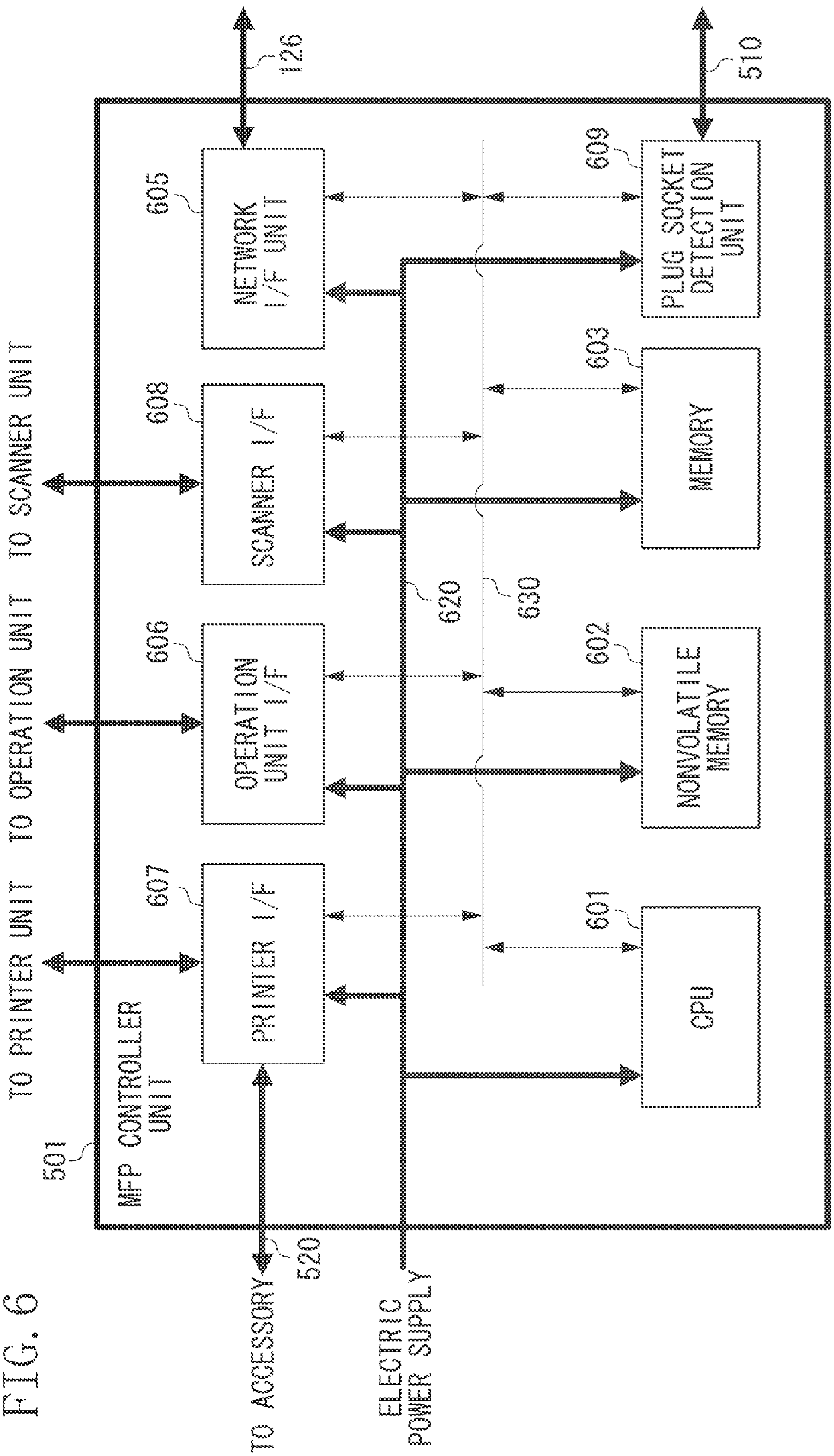
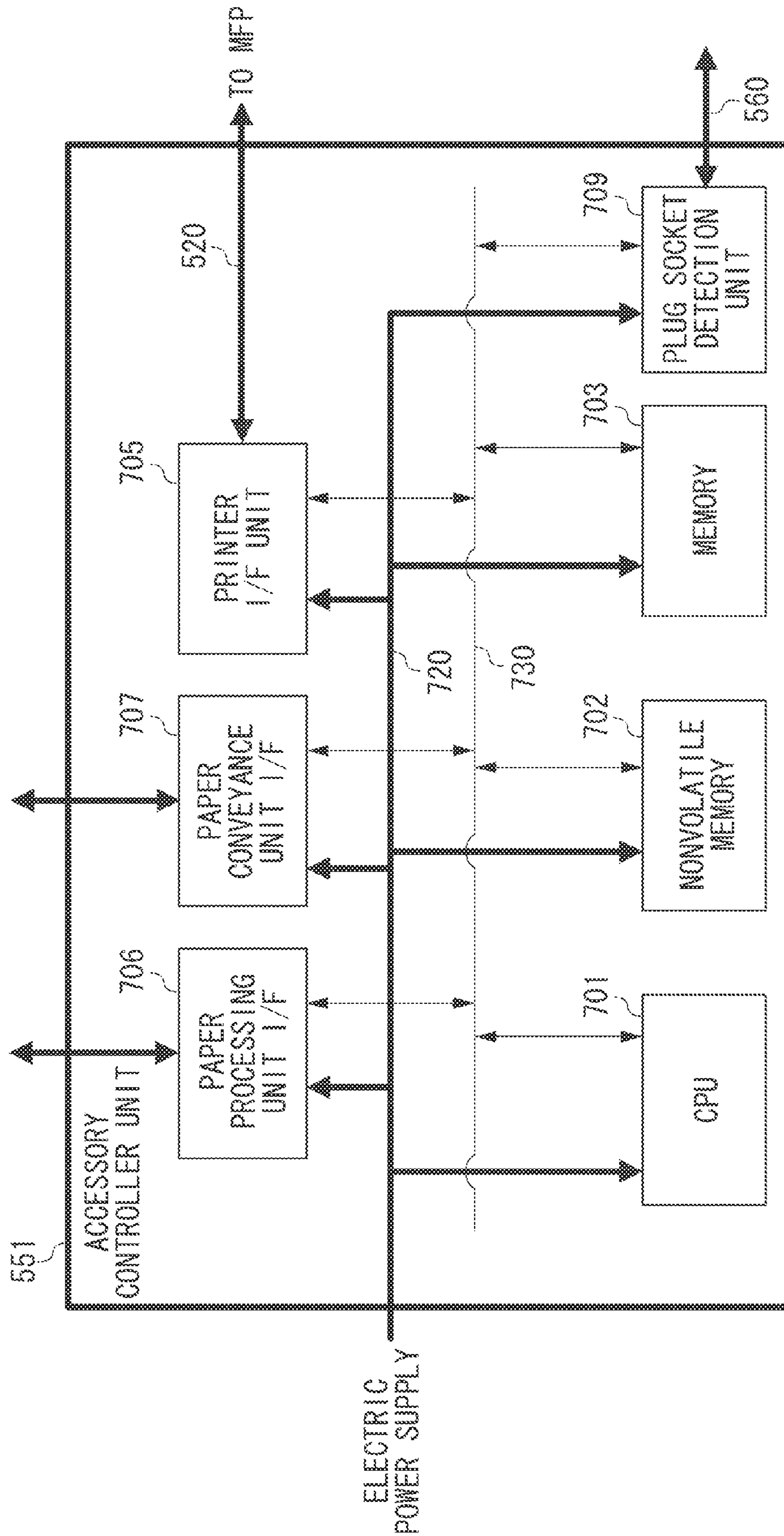

TO PRINTER UNIT
TO OPERATION UNIT
TO SCANNER UNIT
126
510
501
MFP CONTROLLER UNIT
605
NETWORK I/F UNIT
608
SCANNER I/F
606
OPERATION UNIT I/F
607
PRINTER I/F
609
PLUG SOCKET DETECTION UNIT
603
MEMORY
602
NONVOLATILE MEMORY
601
CPU
620
630
520
TO ACCESSORY
ELECTRIC POWER SUPPLY

FIG. 7


TO MFP
560
520
709
PLUG SOCKET DETECTION UNIT
705
PRINTER I/F UNIT
703
MEMORY
720
730
707
PAPER CONVEYANCE UNIT I/F
702
NONVOLATILE MEMORY
TO PAPER CONVEYANCE UNIT
706
PAPER PROCESSING UNIT I/F
701
CPU
TO PAPER PROCESSING UNIT
ACCESSORY CONTROLLER UNIT
551
ELECTRIC POWER SUPPLY

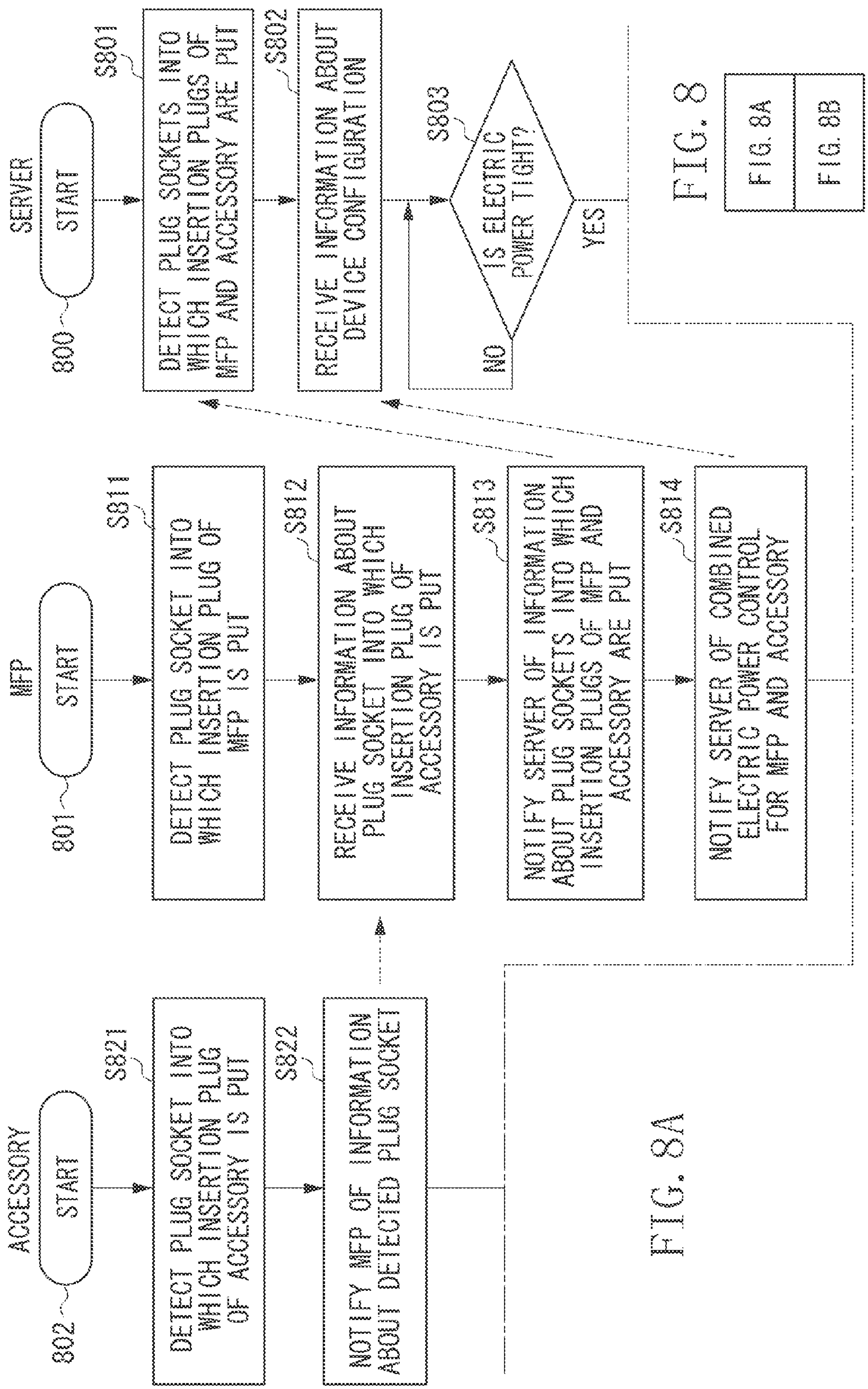

SERVER
800
START
S801
DETECT PLUG SOCKETS INTO WHICH INSERTION PLUGS OF MFP AND ACCESSORY ARE PUT
S802
RECEIVE INFORMATION ABOUT DEVICE CONFIGURATION
S803
IS ELECTRIC POWER TIGHT?
NO
YES
MFP
801
START
S811
DETECT PLUG SOCKET INTO WHICH INSERTION PLUG OF MFP IS PUT
S812
RECEIVE INFORMATION ABOUT PLUG SOCKET INTO WHICH INSERTION PLUG OF ACCESSORY IS PUT
S813
NOTIFY SERVER OF INFORMATION ABOUT PLUG SOCKETS INTO WHICH INSERTION PLUGS OF MFP AND ACCESSORY ARE PUT
S814
NOTIFY SERVER OF COMBINED ELECTRIC POWER CONTROL FOR MFP AND ACCESSORY
ACCESSORY
802
START
S821
DETECT PLUG SOCKET INTO WHICH INSERTION PLUG OF ACCESSORY IS PUT
S822
NOTIFY MFP OF INFORMATION ABOUT DETECTED PLUG SOCKET
FIG. 8A
FIG. 8B

FIG. 8

FIG. 8A

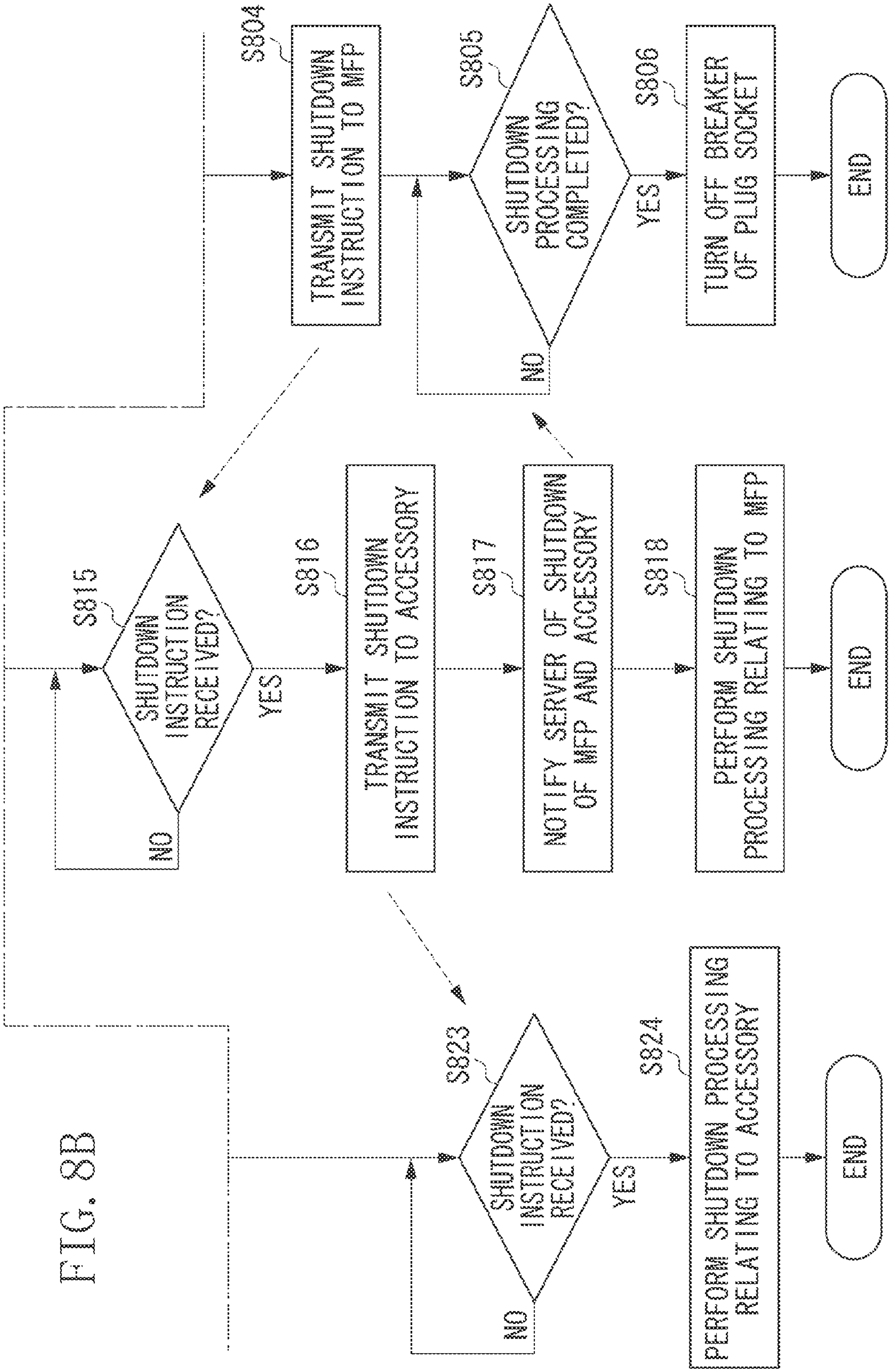

S804
TRANSMIT SHUTDOWN INSTRUCTION TO MFP
S805
SHUTDOWN PROCESSING COMPLETED?
YES
NO
S806
TURN OFF BREAKER OF PLUG SOCKET
END
S815
SHUTDOWN INSTRUCTION RECEIVED?
YES
NO
S816
TRANSMIT SHUTDOWN INSTRUCTION TO ACCESSORY
S817
NOTIFY SERVER OF SHUTDOWN OF MFP AND ACCESSORY
S818
PERFORM SHUTDOWN PROCESSING RELATING TO MFP
END
S823
SHUTDOWN INSTRUCTION RECEIVED?
YES
NO
S824
PERFORM SHUTDOWN PROCESSING RELATING TO ACCESSORY
END

FIG. 8B

FIG. 9

DEVICE NAME (901)	POWER SOURCE SYSTEM (902)	PLUG SOCKET ID (903)	IP ADDRESS OF METER (904)	IP ADDRESS OF DEVICE (905)	IP ADDRESS OF POWER SOURCE SET (906)
ELECTRIC POWER CONTROL SERVER 101	130	1F_roomA_301	192.168.12.1	192.168.1.1	—
MFP 500	150	1F_roomA_504	192.168.12.37	192.168.1.15	192.168.1.15
ACCESSORY 550	140	1F_roomA_413	192.168.12.230	192.168.1.15	192.168.1.15
COMPUTER 104	130	1F_roomA_305	192.168.12.31	192.168.1.20	192.168.1.20
DISPLAY DEVICE 105	130	1F_roomA_306	192.168.12.45	192.168.1.20	192.168.1.20

910

911

FIG. 10

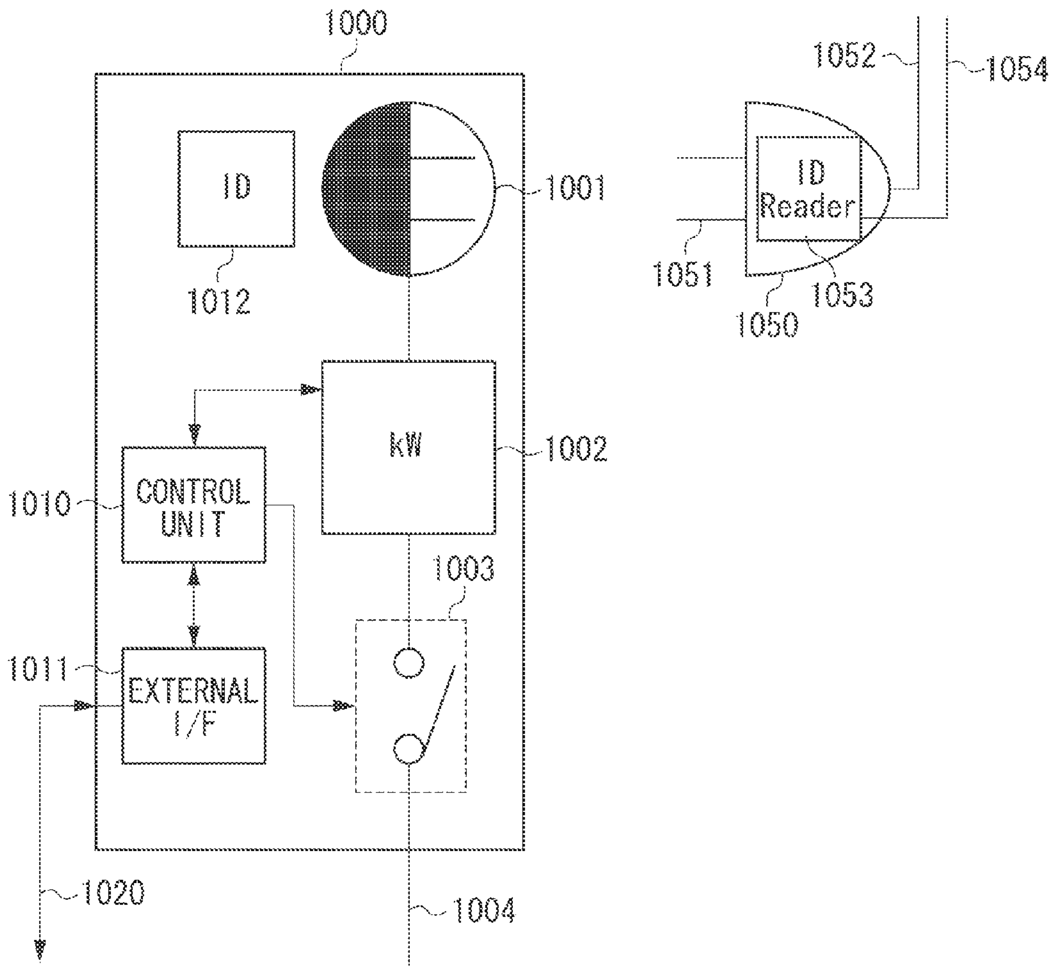
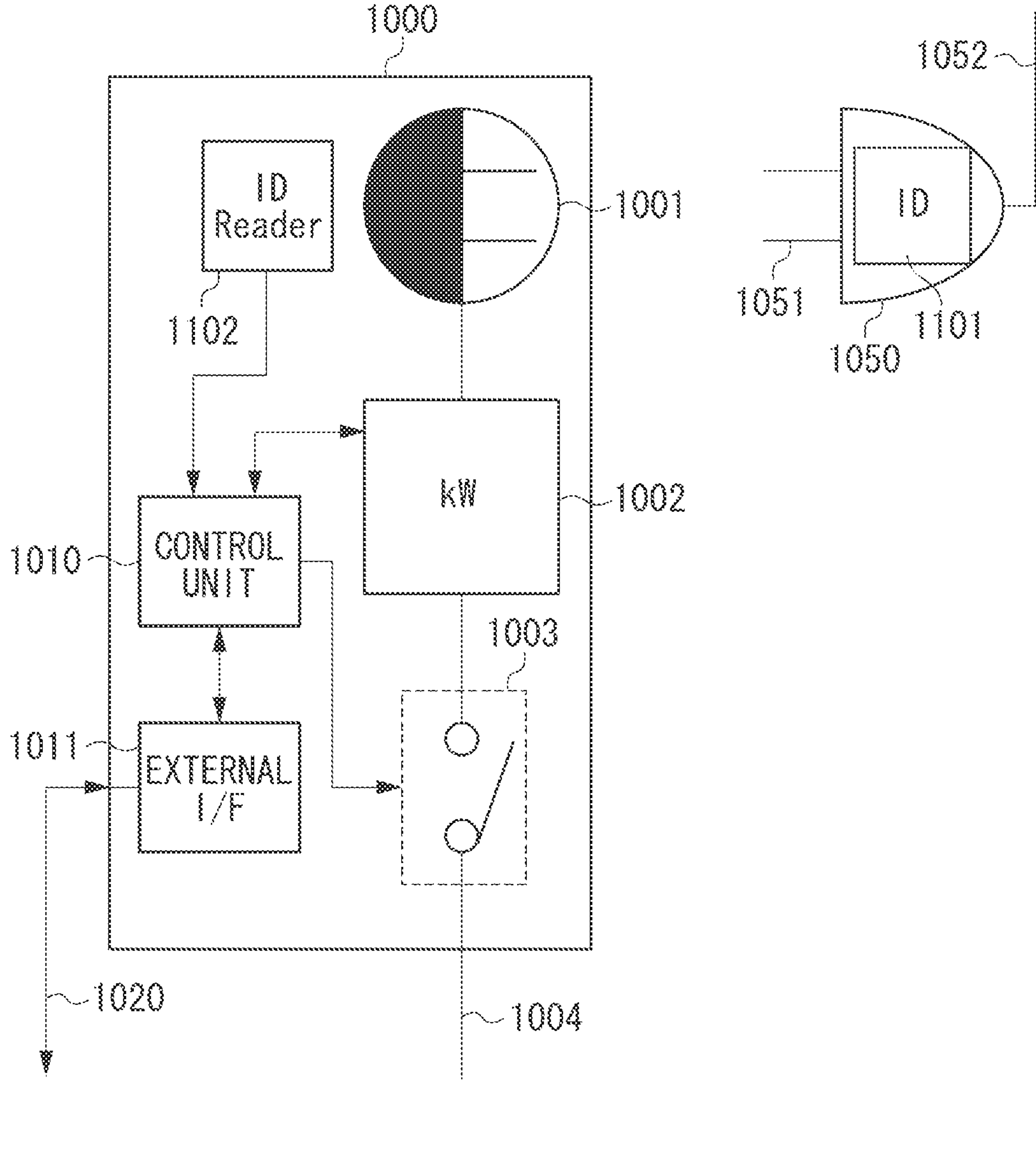

1000
ID
1012
1001
kW
1002
CONTROL UNIT
1010
1003
EXTERNAL I/F
1011
1020
1004
1052
1054
ID Reader
1051
1053
1050

FIG. 11


1000
ID
Reader
1102
1001
kW
1002
1010
CONTROL
UNIT
1003
1011
EXTERNAL
I/F
1020
1004
1052
ID
1051
1101
1050

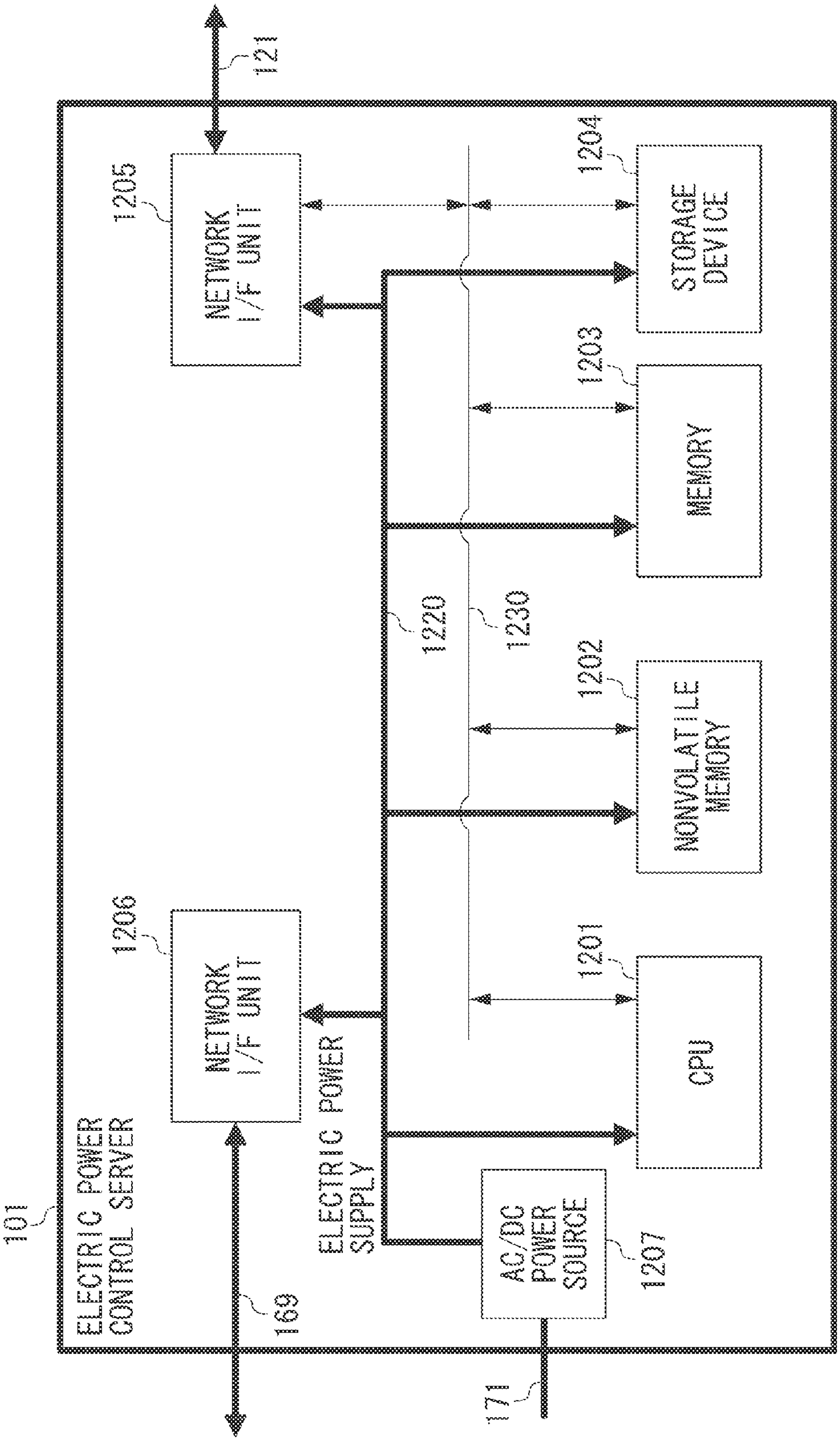

121
1205
NETWORK I/F UNIT
1204
STORAGE DEVICE
1203
MEMORY
1220
1230
1202
NONVOLATILE MEMORY
1206
NETWORK I/F UNIT
1201
CPU
ELECTRIC POWER SUPPLY
101
ELECTRIC POWER CONTROL SERVER
AC/DC POWER SOURCE
1207
169
171

FIG. 12

ELECTRIC POWER CONTROL SYSTEM AND ELECTRIC POWER CONTROL APPARATUS

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to an electric power control system and an electric power control apparatus.

2. Description of the Related Art

An electric power meter that can measure electric power used in an ordinary home, a factory, or an office is conventionally known. An electric power control system discussed in Japanese Patent Application Laid-Open No. 2009-281885 includes a plurality of electric power meters respectively provided for electric power loads, generates data relating to working current used in each electric power load, and transmits the generated current data to an electric power control server. On the other hand, the electric power control server calculates a sum of working current values of respective electric power loads received from respective electric power meters. If the calculated sum exceeds a contract ampere, the electric power control server selects a corresponding detection apparatus and transmits a command instructing shutoff of electric power supplied to an electric power load.

As a result, the electric power control system discussed in Japanese Patent Application Laid-Open No. 2009-281885 can perform electric power shutdown processing for each electric power load when the working current exceeds the contract ampere, without causing a breaker to stop the electric power supply to all loads.

A printing system will be discussed below which includes a printing apparatus (e.g., a printer, a digital copying machine, a digital multifunction peripheral, or a facsimile apparatus), an accessory (e.g., a paper finisher) and a print server that can generate print image data. In such a printing system, it is general that the printing apparatus, the accessory, and the print server are connected to different AC power sources that are dedicated to respective devices. Further, the printing system is configured to perform a printing operation only when the electric power is supplied to all of the printing apparatus, the accessory, and the print server.

However, if the technique discussed in Japanese Patent Application Laid-Open No. 2009-281885 is applied to the above-mentioned printing system, the electric power supply to a part of a plurality of apparatuses whose power source systems are different will be stopped. Therefore, it is undesirable in that the electric power is uselessly consumed because the electric power is continuously supplied to the remaining apparatus, even though the entire printing system cannot perform operations normally.

For example, it is now assumed that electric power is continuously supplied to the print server and the accessory in a state where electric power supply to the printing apparatus is stopped. In this case, although the print server can generate print image data, the print server cannot transmit the generated print image data to the printing apparatus. Further, when the printing apparatus cannot print any image on a paper, no paper can be fed to the accessory. Therefore, the print server and the accessory may uselessly consume electric power.

SUMMARY OF THE INVENTION

The present invention is directed to a mechanism capable of preventing electric power from being continuously supplied to a part of devices that constitute an apparatus system in a state where the apparatus system cannot perform operations normally, thereby reducing an amount of uselessly consumed electric power.

According to an aspect of the present invention, an electric power control system includes a first device configured to perform an operation when electric power is supplied via a first plug socket, a second device configured to perform an operation when electric power is supplied via a second plug socket, which is different from the first plug socket, wherein the first device and the second device are connected in such a way as to communicate with each other, and an electric power control apparatus configured to control the electric power to be supplied to the first device and the second device. The first device includes a notification unit configured to notify the electric power control apparatus of information indicating the second device that is a device relating to the first device. The electric power control apparatus includes an electric power control unit configured to stop supplying electric power to the second device based on the information notified from the notification unit when the electric power control unit stops supplying electric power to the first device.

Further features of the present invention will become apparent from the following description of exemplary embodiments with reference to the attached drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** illustrates an example of an electric power control system according to a first exemplary embodiment.

FIG. **2** is a flowchart illustrating an operation that can be performed by the electric power control system according to the first exemplary embodiment.

FIG. **3** illustrates an example of a power source management table according to the first exemplary embodiment.

FIG. **4** illustrates an example of an electric power control system according to a second exemplary embodiment.

FIG. **5** illustrates an example of a configuration of a print system.

FIG. **6** illustrates an example of a configuration of an MFP controller unit.

FIG. **7** illustrates an example of a configuration of an accessory controller unit.

FIG. **8**, which includes FIG. **8**A and FIG. **8**B, is a flowchart illustrating an operation that can be performed by the electric power control system according to the second exemplary embodiment.

FIG. **9** illustrates an example of a power source management table according to the second exemplary embodiment.

FIG. **10** illustrates a configuration example of an electric power meter.

FIG. **11** illustrates another configuration example of the electric power meter.

FIG. **12** illustrates a configuration example of an electric power control server.

DESCRIPTION OF THE EMBODIMENTS

Various exemplary embodiments, features, and aspects of the invention will be described in detail below with reference to the drawings.

Exemplary embodiments of the present invention defined by the claims are not limited to only the following exemplary embodiments. Further, it should be noted that all of possible combinations of characteristic features described in the following exemplary embodiments are not always essential features of the present invention.

FIG. **1** illustrates a configuration example of an electric power control system according to a first exemplary embodiment of the present invention. As illustrated in FIG. **1**, the electric power control system according to the first exemplary embodiment includes an electric power control server **101**, an electric power meter **111**, an electric power meter **112**, and an electric power meter **113**.

An apparatus system (i.e., a device system) **100** includes at least one apparatus (i.e., electric power load). There is a plurality of plug sockets (i.e., power lines) via which electric power can be supplied to the apparatus system **100**. For example, the apparatus system **100** is a home appliance device, an information device, an acoustic imaging apparatus, a game console, a manufacturing apparatus, a financial device, a transportation system, or a security apparatus. Although the apparatus system **100** includes an electric power load **102** and an electric power load **103** as described below, the apparatus system **100** can include three or more electric power loads.

In the present exemplary embodiment, the apparatus system **100** can be a home appliance system, such as an air conditioning system. In this case, the electric power load **102** is, for example, an air conditioning outdoor unit. The electric power load **103** is, for example, an air conditioning indoor unit. Further, the apparatus system **100** can be an information system. In this case, the electric power load **102** is, for example, a personal computer. The electric power load **103** is, for example, a display device or a network device.

Further, the apparatus system **100** can be an acoustic imaging system. In this case, the electric power load **102** is, for example, an acoustic imaging player. The electric power load **103** is, for example, a display device or an amplification device. Further, the apparatus system **100** can be a game console. In this case, the electric power load **102** is, for example, a game console unit. The electric power load **103** is, for example, a display device, an amplification device, or a network device.

Further, the apparatus system **100** can be a manufacturing system. In this case, the electric power load **102** is, for example, a manufacturing robot. The electric power load **103** is, for example, a robot control apparatus. Further, the apparatus system **100** can be a financial device, such as an automated teller machine system. In this case, the electric power load **102** is, for example, an automated teller machine. The electric power load **103** is, for example, a network device or server.

Further, the apparatus system **100** can be a transportation system, such as an automatic ticket gate system. In this case, the electric power load **102** is, for example, an automatic ticket gate. The electric power load **103** is, for example, a network device or a server. Further, the apparatus system **100** can be a security system, such as a monitoring camera or an infrared beam sensor. The electric power load **102** is, for example, a sensing device, such as a monitoring camera or an infrared beam sensor. The electric power load **103** is, for example, a display device, a storage device, or a report apparatus.

Electric power can be supplied to the electric power load **102** via a power line **172** and the electric power meter **112** from a power line **150**. Similarly, electric power can be supplied to the electric power load **103** via a power line **173** and the electric power meter **113** from a power line **140**. The electric power load **102** and the electric power load **103** have a predetermined relationship. In a state where no electric power is supplied to either the electric power load **102** or the electric power load **103**, the apparatus system **100** cannot realize its functions in whole or in part. More specifically, to enable the apparatus system **100** to perform all functions, it is necessary to supply electric power to all electric power loads provided in the apparatus system **100**.

The electric power load **102** and the electric power load **103** are connected to a communication line **120**, such as Ethernet (registered trademark), via communication lines **122** and **123**, respectively. The electric power load **102** and the electric power load **103** can communicate with each other via the communication line **120**. Further, each of the electric power load **102** and the electric power load **103** can communicate with any other device (e.g., the electric power control server **101**) accessible via the communication line **120**.

The electric power control server **101** can communicate with each of the electric power meter **111**, the electric power meter **112**, and the electric power meter **113** to acquire data relating to voltage, current, electric power, or electric power amount. More specifically, the electric power control server **101** can communicate with the electric power meter **111**, the electric power meter **112**, and the electric power meter **113** via a communication line **160**, such as Ethernet (registered trademark). Electric power can be supplied to the electric power control server **101**, via a power line **171** and the electric power meter **111**, from a power line **130**. The electric power control server **101** has an internal configuration described below.

The electric power meter **111** can transmit data relating to voltage and current of the power line **171** of the electric power control server **101** or data relating to electric power (or electric power amount) consumed by the electric power control server **101** to the electric power control server **101** via communication lines **161**, **160**, and **169**. The electric power meter **111** includes a switch capable of selectively disabling (OFF) or enabling (ON) electric power supply to the electric power control server **101** in response to an instruction received from the electric power control server **101** via the communication lines **169**, **160**, and **161**. When the electric power control server **101** performs an operation, the electric power meter **111** closes (turns on) the above-mentioned switch.

The electric power meter **112** can transmit data relating to voltage and current of the power line **172** of the electric power load **102** or data relating to electric power (or electric power amount) consumed by the electric power load **102** to the electric power control server **101** via communication line **162**. Similarly, the electric power meter **113** can transmit data relating to voltage and current of the power line **173** of the electric power load **103** or data relating to electric power (or electric power amount) consumed by the electric power load **103** to the electric power control server **101** via communication lines **163**.

The electric power meter **112** includes a switch capable of selectively disabling (OFF) or enabling (ON) electric power supply to the electric power load **102** in response to an instruction received from the electric power control server **101** via the communication line **162**. The electric power meter **113** includes a switch capable of selectively disabling (OFF) or enabling (ON) electric power supply to the electric power load **103** in response to an instruction received from the electric power control server **101** via the communication line **163**. When the electric power load **102** performs an operation, the electric power meter **112** closes (turns on) the above-mentioned switch. Each of the electric power meters **111**, **112** and **113** has a configuration described in detail below.

The power lines **130**, **140**, and **150** are power lines of AC 100 V power source, respectively. It is needless to say that the present invention is not limited to 100 V.

The communication line **120** is connected to the electric power control server **101** via a communication line **121**. The communication line **120** is connected to the electric power load **102** via the communication line **122**. The communication line **120** is connected to the electric power load **103** via the communication line **123**. In other words, the electric power control server **101** can communicate with the electric power loads **102** and **103** via the communication lines **121**, **122**, and **123**.

Each of the communication lines **120** and **160** is not limited to the Ethernet (registered trademark) type and can be a wired communication type, such as RS-232 or Power Line Communication (PLC). Further, each of the communication lines **120** and **160** can be a wireless communication type, such as wireless Local Area Network (LAN), Bluetooth (registered trademark), ZigBee (registered trademark), Radio Frequency IDentification (RFID), or wireless Universal Serial Bus (USB).

In the present exemplary embodiment, only one electric power load is connected to each electric power meter. However, the above-mentioned system configuration can be modified in such a way as to connect a plurality of electric power loads to each electric power meter. The number of the electric power meters and the number of the electric power loads are not limited to the above-mentioned example. The electric power control system can be configured to include a plurality of apparatus systems **100**.

Next, a configuration of the electric power control server **101** is described in detail below with reference to FIG. **12**. FIG. **12** is a block diagram illustrating a configuration example of the electric power control server **101**. In FIG. **12**, a central processing unit (CPU) **1201** can execute various programs including a control processing routine described below. The CPU **1201** is functionally operable as a detection unit, a notification unit, and a power source control unit of the electric power control system according to the present exemplary embodiment by performing various controls based on computer readable programs stored in a nonvolatile memory **1202** and a storage device **1204**.

The nonvolatile memory **1202** is, for example, a read only memory (ROM). The nonvolatile memory **1202** stores a startup program for the CPU **1201** and various programs to realize various operations according to control processing routines described below. A random access memory (RAM) **1203** can be used as a work area when the CPU **1201** executes various programs or an image memory that temporarily stores image data.

Each of two network I/F units **1205** and **1206** is, for example, constituted by a network interface card (NIC). The network I/F unit **1205** is connected to the LAN **121** and can perform various network controls, including communications with the apparatus system **100**. The network I/F unit **1206** is connected to the LAN **169** and can perform various network controls, including communications with the electric power meters **111**, **112**, and **113**. Although the electric power control server **101** includes two network I/F units **1205** and **1206** as mentioned above, the number of network I/F units is not limited to two. The electric power control server **101** can include one network I/F unit or three or more network I/F units.

The storage device **1204** is, for example, constituted by a hard disk or a Solid State Disk (SSD). The storage device **1204** stores a startup program for the CPU **1201** and various programs to realize various operations according to control processing routines described below.

An AC-DC power source **1207** can generate electric power to be supplied to each portion of the electric power control server **101**. A power source line **1220** supplies electric power to each portion of the electric power control server **101**. A bus **1230** enables each unit of the electric power control server **101** to communicate with other units. Each of the electric power load **102** and the electric power load **103** has a configuration similar to the configuration of the electric power control server **101** illustrated in FIG. **12**.

Next, operations that can be performed by the apparatus system **100** and the electric power control server **101** according to the first exemplary embodiment are described in detail below with reference to FIG. **2**. FIG. **2** is a flowchart illustrating an example of the operations that can be performed by the apparatus system **100** and the electric power control server **101** according to the first exemplary embodiment.

In FIG. **2**, a flowchart **200** illustrates an example of the processing that can be performed by the CPU **1201** provided in the electric power control server **101**. A program including the processing of the flowchart **200** is stored in the memory **1203**, the nonvolatile memory **1202**, or the storage device **1204** provided in the electric power control server **101**. Further, a flowchart **201** illustrates an example of the processing that can be performed by a CPU (not illustrated) of the electric power load **102** included in the apparatus system **100**. A program including the processing of the flowchart **201** is stored in a memory (not illustrated) of the electric power load **102**. Further, a flowchart **202** illustrates an example of the processing that can be performed by a CPU (not illustrated) of the electric power load **103** provided in the apparatus system **100**. A program including the processing of the flowchart **202** is stored in a memory (not illustrated) of the electric power load **103**.

First, an example of the operation that can be performed step by step by the electric power load **103** is described in detail below with reference to the flowchart **202**. In step S**221**, the electric power load **103** transmits information about the power source control configuration of the electric power load **103** to the electric power load **102**. The information about the power source control configuration of the electric power load **103** includes information that identifies the electric power load **103** (hereinafter, referred to as "identification information") and identification information about a plug socket (or power line) connected to the electric power load **103**. In the present exemplary embodiment, the identification information about the electric power load **103** and the identification information about the plug socket (or power line) are, for example, expressed as Internet Protocol (IP) addresses.

However, the identification information about the electric power load **103** and the identification information about the plug socket (or power line) are not limited to IP addresses. For example, any other appropriate information (e.g., Media Access Control (MAC) address or RFID) can be used as identification information.

Further, in a case where the plug socket (or power line) to be connected to the electric power load **103** is determined beforehand, it is unnecessary to transmit the identification information about the plug socket (or power line) connected to the electric power load. Further, although the information about the electric power load **103** is transmitted to the electric power load **102** as described above for illustrative purposes, the processing according to the present exemplary embodiment can be modified appropriately. For example, the identification information about the electric power load **103** can be directly transmitted to the electric power control server **101**.

Next, in step S**222**, the electric power load **103** determines whether a power shutdown preparatory processing instruction (i.e., "shutdown instruction" described in FIG. **2**) has been received. For example, the electric power load **103** waits for a while until a signal or a command indicating the power shutdown preparatory processing instruction is received from the electric power control server **101**. Although the electric power load **103** is configured to receive the power shutdown preparatory processing instruction from the electric power control server **101** as described above for illustrative purposes, the present exemplary embodiment can be modified appropriately. For example, the electric power load **103** can be configured to receive the power shutdown preparatory processing instruction from the electric power load **102**. If the electric power load **103** determines that the power shutdown preparatory processing instruction has been received (Yes in step S**222**), the operation proceeds to step S**223**.

In step S**223**, the electric power load **103** performs power shutdown preparatory processing (i.e., "shutdown processing" described in FIG. **2**) relating to the electric power load **103**. The power shutdown preparatory processing to be performed in step S**223** can bring the electric power load **103** into a state ready for electric power shutdown. For example, the electric power load **103** transmits local information to the electric power load **102** or other device (e.g., a cloud server) to synchronize the information. Alternatively, the electric power load **103** writes information stored in a volatile memory (e.g., dynamic random access memory DRAM), in a nonvolatile storage device (e.g., a hard disk or a flash ROM) or transmits the information to a network device.

Further, in a case where the electric power load **103** does not possess any local information or volatile information, it is unnecessary for the electric power load **103** to do the above-mentioned processing. Further, in a case where the electric power load **103** includes a shutdown operation mechanism capable of stopping electric power supply to the electric power load **103**, the electric power load **103** can cause the mechanism to perform a shutdown operation.

Further, in this case, if the electric power load **103** includes a mechanical mechanism, the electric power load **103** can cause the mechanical mechanism to interrupt the operation and move to a position where the operation of the mechanical mechanism can be stabilized. Further, in this case, if the electric power load **103** includes an energy mechanism (e.g., a heater or a burner), the electric power load **103** can stop energy supply to the energy mechanism and cool the mechanism body in such a way as to prevent the energy mechanism from failing or being damaged.

Next, an example of the operation that can be performed step by step by the electric power load **102** is described in detail below with reference to the flowchart **201**. In step S**211**, the electric power load **102** receives information about the power source control configuration of the electric power load **103** (i.e., another electric power load that constitutes the apparatus system **100**). Although there is only one electric power load (i.e., the electric power load **103**) remaining in FIG. **1**, the apparatus system **100** can be configured to include two or more other electric power loads. The information about the power source control configuration of the electric power load **103** is already mentioned in step S**221** and therefore detailed description thereof will be avoided.

Next, in step S**212**, the electric power load **102** transmits information about the power source control configuration of the apparatus system **100**, which includes the information about the power source control configuration of the electric power load **103** (i.e., the above-mentioned information received in step S**211**) and information about the power source control configuration of the electric power load **102**, to the electric power control server **101**. The information about the power source control configuration of the electric power load **102** includes identification information about the electric power load **102** and identification information about a plug socket (or power line) connected to the electric power load **102**. The identification information about the electric power load **102** and the identification information about the plug socket (or power line) connected to the electric power load **102** are similar to the identification information about the electric power load **103** and the identification information about the plug socket (or power line) connected to the electric power load **103** already mentioned in step S**221**. Therefore, detailed description thereof will be avoided.

Further, the information about the power source control configuration of the apparatus system **100** includes information about combination, order, and time difference with respect to the electric power loads of the apparatus system **100** to be subjected to the power shutdown processing. In the present exemplary embodiment, the power shutdown processing is performed simultaneously on the electric power load **102** and the electric power load **103** for illustrative purposes. Further, the information about the power source control configuration of the apparatus system **100** includes information indicating that the apparatus system **100** cannot operate normally when the electric power supply to one of the electric power load **102** and **103** is stopped.

Next, in step S**213**, the electric power load **102** determines whether the power shutdown preparatory processing instruction (i.e., "shutdown instruction) has been received. For example, the electric power load **102** waits for a while until a signal or a command indicating the power shutdown preparatory processing instruction is received from the electric power control server **101**. The processing to be performed in step S**213** is similar to the processing performed in step S**222**. Therefore, detailed description thereof will be avoided. If the electric power load **102** determines that the power shutdown preparatory processing instruction has been received (Yes in step S**213**), the operation proceeds to step S**214**.

In step S**214**, the electric power load **102** performs power shutdown preparatory processing (i.e., the shutdown processing) relating to the electric power load **102**. The processing to be performed in step S**214** is similar to the processing performed in step S**223** and therefore detailed description thereof will be avoided. Although the electric power load **102** performs the power shutdown preparatory processing as mentioned above, it is also useful to instruct the remaining electric power load (e.g., the electric power load **103**) constituting the apparatus system **100** to perform power shutdown preparatory processing if the power shutdown preparatory processing instruction is received in step S**214**.

Next, an example of the operation that can be performed step by step by the electric power control server **101**, included in the configuration example illustrated in FIG. **1**, is described in detail below with reference to the flowchart **200**. In step S**201**, the electric power control server **101** receives the above-mentioned information about the power source control configuration of the apparatus system **100** (i.e., the information received from the electric power load **102** in the present exemplary embodiment). In the present exemplary embodiment, in a case where the plug socket (or power line) connected to each electric power load is determined beforehand, it is presumed that device name of the electric power load, identification information about the plug socket, and identification information about an electric power meter corresponding to the plug socket are associated with each other and the relationship thereof is registered beforehand in the electric power control server **101**.

The identification information about the electric power meter is, for example, IP address or MAC address of the electric power meter, which is similar to other identification information. The electric power control server **101** generates a power source management table (e.g., illustrated in FIG. **3**) that manages identification information about respective electric power meters, which are connected to the electric power loads **102** and **103**, based on the above-mentioned received information about the power source control configuration of the apparatus system **100**.

The information stored in the power source management table includes device unique information (e.g., IP address or MAC address) of each electric power load, name of a plug socket (or power line) connected to the electric power load, identification information about each electric power meter, and the power source system which are associated with the device name (e.g., the electric power loads **102** and **103**). Further, the above-mentioned power source management table can be used to manage the name of each plug socket (or power line) connected to the electric power control server **101**, identification information about each electric power meter, and the power source system. The power source management table will be described in detail below.

In the present exemplary embodiment, as described above, the electric power control server **101** is configured to receive the configuration information about respective electric power loads of the apparatus system **100** from the electric power load **102**, for illustrative purposes. However, the system configuration can be modified appropriately. For example, the electric power control server **101** can be modified to receive the information about power source control configuration of respective electric power load **102** and **103** from the electric power load **103** or can be modified to receive the power source control configuration information from each of the electric power loads **102** and **103**. Further, in a case where a plug socket (or power line) connected to an electric power load is determined beforehand, it is unnecessary for the electric power control server **101** to receive the identification information about the plug socket (or power line) connected to the electric power load.

Next, in step S**202**, the electric power control server **101** determines whether the electric power is in a tight state with respect to the power lines **130**, **140**, and **150** (i.e., the power source systems in the present exemplary embodiment) of the electric power control server **101** and respective electric power loads **102** and **103**, with reference to the above-mentioned power source management table. First, the electric power control server **101** receives electric power consumption information from the electric power meters **111**, **112**, and **113** that are connected to the plug sockets of the electric power control server **101** and the electric power loads **102** and **103**. Then, the electric power control server **101** obtains electric power consumption in each power source system (i.e., each of the power lines **130**, **140**, and **150** in the present exemplary embodiment).

For example, in a case where a plurality of electric power meters is connected to a single power source system, a sum of electric power consumptions measured by respective electric power meters is a total electric power consumption of the power source system. Alternatively, it is useful to provide a dedicated electric power meter for each power source system (i.e., each of the power lines **130**, **140**, and **150**) to obtain electric power consumption of each power source system.

Next, the electric power control server **101** compares a predetermined threshold value (e.g., an upper-limit value of electric power consumption) having been set beforehand for each power source system (i.e., each of the power lines **130**, **140**, and **150**) with the electric power consumption of each power source system (i.e., each of the power lines **130**, **140**, and **150**). If the electric power consumption of each power source system (i.e., each of the power lines **130**, **140**, and **150**) does not exceed the threshold value, the electric power control server **101** determines that the electric power is not tight. The determination result in step S**202** is NO. Therefore, the electric power control server **101** repeats the determination processing in step S**202**.

On the other hand, if the electric power consumption of any one of the power source systems (i.e., the power lines **130**, **140**, and **150**) is greater than the threshold value, the electric power control server **101** determines that the electric power is tight. The determination result in step S**202** is YES. Therefore, the operation of the electric power control server **101** proceeds to step S**203**.

In step S**203**, the electric power control server **101** instructs the apparatus system **100** (i.e., the device connected to the power source system whose electric power is tight) to perform power shutdown preparatory processing (i.e., "shutdown processing" described in FIG. **2**). For example, when the electric power of the power line **150** is tight, the electric power control server **101** instructs the electric power load **102** (i.e., the device connected to the power line **150**) to perform power shutdown preparatory processing, with reference to the above-mentioned power source management table (see FIG. **3**). Further, the electric power control server **101** instructs the electric power load **103** (i.e., the remaining power load that constitutes the apparatus system **100** together with the electric power load **102**) to perform power shutdown preparatory processing, with reference to the power source management table.

In the present exemplary embodiment, for illustrative purposes, the electric power control server **101** sequentially transmits the power shutdown preparatory processing instructions to the electric power load **102** and the electric power load **103** in this order. However, for example, as a modified embodiment, the electric power control server **101** can simultaneously transmit the power shutdown preparatory processing instruction to both of the electric power load **102** and the electric power load **103**. Alternatively, the electric power control server **101** can sequentially transmit the power shutdown preparatory processing instructions to the electric power load **103** and the electric power load **102** in this order. Further, the electric power control server **101** can transmit an electric power shutdown notification, instead of transmitting the power shutdown preparatory processing instruction.

Next, in step S**204**, the electric power control server **101** determines whether the power shutdown preparatory processing (i.e., the shutdown processing) has been completed in the device connected to the power line whose electric power is tight. For example, in a case where the electric power load **102** and the electric power load **103** are information devices that require a significant amount of time to complete the power shutdown preparatory processing, the electric power control server **101** waits until the power shutdown preparatory processing completes.

In a case where the electric power load **102** and the electric power load **103** are devices capable of completing the power shutdown preparatory processing within a comparatively short time, it is unnecessary to provide a waiting time before completing the power shutdown preparatory processing of the apparatus system **100**. In this case, information described in the above-mentioned power source management table (see **307** illustrated in FIG. **3**) can be referred to when the electric power control server **101** determines whether to wait for a while until the power shutdown preparatory processing completes.

In determining whether the device connected to the power line whose electric power is tight has been shut down, the electric power control server **101** can communicate with an output meter connected to the device to monitor the electric power consumption and can determine that the shutdown processing has been completed when the electric power consumption of the device reaches a predetermined value (i.e., a power consumption value in a shutdown completion state). The power consumption value in the shutdown completion state of each device can be registered beforehand in the electric power control server **101** or can be acquired in the above-mentioned step S**201**.

Further, in a case where the information acquired in the above-mentioned step S**201** includes time required for the device to complete the shutdown processing, the electric power control server **101** can determine that the shutdown processing of the device has been completed when the time has elapsed. The time required for each device to complete the shutdown processing can be registered beforehand in the electric power control server **101**.

If the electric power control server **101** determines that the power shutdown preparatory processing is not yet completed in the apparatus system **100** connected to the power line whose electric power is tight (No in step S**204**), the electric power control server **101** repeats the determination processing in step S**204**. On the other hand, if the electric power control server **101** determines that the power shutdown preparatory processing has been completed in the apparatus system **100** connected to the power line whose electric power is tight (Yes in step S**204**), the operation proceeds to step S**205**.

In step S**205**, the electric power control server **101** instructs the electric power meter connected to the apparatus system **100** connected to the power line whose electric power is tight, to stop the electric power supply operation (i.e., turn off the breaker of the plug socket illustrated in FIG. **2**). For example, the electric power control server **101** issues a command to stop the electric power supply operation for IP address or MAC address of respective electric power meters **112** and **113** described in the above-mentioned power source management table and gives an instruction in such a way as to supply no electric power to respective power lines **172** and **173** connected to the electric power meters **112** and **113**. In response to the above-mentioned instruction, each of the electric power meters **112** and **113** turns off a switch **1003** (see FIG. **10** or FIG. **11**) to stop the electric power supply operation for the device. As mentioned above, in the present exemplary embodiment, the power source of the system illustrated in FIG. **1** can be managed appropriately.

Next, the power source management table of the electric power control system according to the first exemplary embodiment is described in detail below with reference to FIG. **3**. FIG. **3** illustrates an example of the power source management table that indicates power lines to which the apparatus system **100** illustrated in FIG. **1** is connected, communication destinations of the apparatus system **100**, and a relationship between constituent devices of the apparatus system **100** to be subjected to the power source shutdown processing.

The power source management table is stored in the memory **1203** or the storage device **1204** of the electric power control server **101**. Further, the power source management table illustrated in FIG. **3** can be generated in step S**201** illustrated in FIG. **2** (i.e., by the processing to be performed by the CPU **1201** provided in the electric power control server **101**) and can be referred to in step S**202**, step S**203**, step S**204**, and step S**205**. A data format (character string) of FIG. **3** is easy for a user to recognize. However, any other data format (e.g., binary value or alphanumeric data) that can be easily managed by the electric power control server **101** is employable as the data format of FIG. **3**.

In FIG. **3**, a data string **301** indicates device name of each device (i.e., each of the electric power control server **101** and the electric power loads **102** and **103**). The device name **301** is described in step S**201** illustrated in FIG. **2**. Alternatively, the device name **301** can be described beforehand. A data string **302** indicates power source system (power line) to which each device of the device name **301** is connected.

A data string **303** indicates plug socket ID usable to identify a plug socket and an electric power meter to which each device of the device name **301** is connected. The plug socket ID **303** is information differentiated for each plug socket to uniquely identify the plug socket and the electric power meter. For example, MAC address or IP address of each electric power meter is usable as the plug socket ID **303**. The plug socket ID **303** is described in step S**201** illustrated in FIG. **2**. Alternatively, the plug socket ID **303** can be described beforehand. For example, to connect each device of the device name **301** to a proper plug socket, a data format (character string) of the plug socket ID **303** is easy to understand. For example, "1F_roomA_**504**" of the plug socket ID **303** (i.e., the data described in line **310** and row **303**) indicates a plug socket #**504** in a room "A" located on the first floor of a building.

A data string **304** indicates communication destination of an electric power meter to which each device of the device name **301** is connected. The information about the communication destination **304** of the electric power meter can be referred to when the electric power control server **101** communicates with respective electric power meters. The communication destination **304** described in the table is IP address of each electric power meter. However, any other information (e.g., MAC address of the electric power meter) usable to communicate with the electric power meter is employable to describe the communication destination **304**. The communication destination **304** of each electric power meter is described in step S**201** illustrated in FIG. **2**. Alternatively, the communication destination **304** can be described beforehand. The communication destination **304** can be referred to in step S**202**.

A data string **305** indicates communication destination of each device of the device name **301**. The information about the device communication destination **305** can be referred to when the electric power control server **101** communicates with each device of the device name **301**. The device communication destination **305** described in the table is IP address of each device of the device name **301**. However, any other information (e.g., MAC address of each device of the device name **301**) usable to communicate with the device of the device name **301** is employable to describe the device communication destination **305**. The device communication destination **305** is described in step S**201** illustrated in FIG. **2**.

A data string **306** indicates a device constituting the apparatus system together with the device of the device name **301**. The number of the data **306** is equal to the number of devices that constitute the apparatus system together with the device of the device name **301**. In the present exemplary embodiment, the data **306** described in the table is IP address of the device of the device name **301**. However, any other information usable to communicate with the device of the device name **301** (e.g., MAC address of the device of the device name **301**) is employable to described the data **306**. The communication destination **306** of each constituent device of the apparatus system is described in step S**201** illustrated in FIG. **2** and can be referred to in step S**203**, step S**204**, and step S**205**.

In the present exemplary embodiment, only one destination is described as the communication destination **306** for illustrative purposes. However, it is feasible to describe a plurality of pieces of information. For example, in a case where the apparatus system includes two or more constituent devices, two or more IP addresses are described in the communication destination **306**.

A data string **307** indicates information indicating whether to wait until the shutdown processing completes for the device of the device name **301** in a case where the power supply shutdown (plug socket breaker OFF) instruction is transmitted to the electric power meter of a plug socket connected to the device of the device name **301**. The power source management table illustrated in FIG. **3** includes information relating to the electric power load **102** described in a data row **310**.

As mentioned above, the system having the configuration illustrated in FIG. **1** can manage the power source by performing processing according to the flowchart illustrated in FIG. **2** and can perform a shutdown operation in such a way as to entirely stop the electric power supply to the apparatus system **100** having a plurality of plug sockets, with reference to the power source management table illustrated in FIG. **3**. As a result, the electric power control system according to the first exemplary embodiment can prevent electric power from being uselessly consumed, because the electric power is not continuously supplied to the electric power loads of the apparatus system **100** when the apparatus system **100** cannot operate normally.

A second exemplary embodiment is described in detail below with reference to the attached drawings. FIG. **4** illustrates a configuration example of an electric power control system according to the second exemplary embodiment of the present invention. The electric power control system illustrated in FIG. **4** includes an apparatus system **100***a*, an apparatus system **100***b*, an electric power meter **114**, an electric power meter **115**, an electric power meter **116**, and an electric power meter **117**, in addition to the electric power control server **101** and the electric power meter **111** described in the above-mentioned exemplary embodiment. The electric power control server **101**, the electric power meter **111**, the communication lines **120** and **160**, the power lines **130**, **140**, and **150** are similar to those described in the first exemplary embodiment (see FIG. **1**) and therefore detailed description thereof will be avoided.

Each of the apparatus systems **100***a* and **100***b* is an apparatus system having a plurality of plug sockets (power lines). The apparatus system **100***a* is a printer system (i.e., an image forming system), which are constituted by a multi function peripheral (MFP) **500** and an accessory **550**, as described in detail below. The computer system **100***b* is constituted by a personal computer (PC) **104** and a display device **105**, as described below.

Hereinafter, the MFP **500** and the accessory **550** that cooperatively constitute the printer system **100***a* are described in detail below. The MFP **500** is an integrated device having copy, printer, and scanner functions. Electric power can be supplied to the MFP **500** via a power line **176**. The MFP **500** is connected to the communication line **120** via the communication line **126** and can communicate with the electric power control server **101** and the computer **104**. The accessory **550** and the MFP **500** can cooperatively perform operations.

The accessory **550** is a device capable of performing post-processing, such as sorting, stapling, punching, folding, and cutting, on a paper (i.e., a recording sheet) printed by the MFP **500**. Electric power can be supplied to the accessory **550** via a power line **177**. The accessory **550** can communicate with the MFP **500**. A configuration example of the MFP **500** and the accessory **550** is described in detail below.

Next, the computer **104** and the display device **105** of the computer system **100***b* are described in detail below. The computer **104** is a personal computer (PC) that can be operated by a user. Electric power can be supplied to the computer **104** via a power line **174**. The computer **104** is connected to the communication line **120** via a communication line **124** and can communicate with the electric power control server **101** and the MFP **500**. The display device **105** is an apparatus capable of displaying information about the computer **104**. Electric power can be supplied to the display device **105** via a power line **175**. The display device **105** is, for example, a cathode ray tube (CRT), a liquid crystal display, a plasma display, or a light-emitting diode (LED). The display device **105** can communicate with the PC **104**.

The electric power meters **114**, **115**, **116**, and **117** can measure the amount of electric power supplied to the computer **104**, the display device **105**, the MFP **500**, and the accessory **550**, respectively. The electric power meters **114**, **115**, **116**, and **117** are similar to the electric power meters **112** and **113** described in the first exemplary embodiment and therefore detailed description thereof will be avoided.

Each of the communication lines **126** and **124** is, for example, Ethernet (registered trademark) type. However, each of the communication lines **126** and **124** is not limited to the above-mentioned example and can be a wired communication type, such as RS-232 or Power Line Communication (PLC). Further, each of the communication lines **120** and **160** can be a wireless communication type, such as wireless LAN, Bluetooth (registered trademark), ZigBee (registered trademark), or Radio Frequency IDentification (RFID).

Similar to the apparatus system **100** according to the first exemplary embodiment, the printer system **100***a* and the computer system **100***b* cannot perform operations at least partly when no electric power is supplied to any one of the plug sockets (or power lines). For example, the printer system **100***a* cannot perform a printing operation when no electric power is supplied to any one of the plug sockets (or power lines). More specifically, the MFP **500** cannot print an image on a print medium (e.g., a paper) when no electric power is supplied to the MFP **500** via the power line **176**. The accessory **550** cannot discharge a print medium printed by the MFP **500** when no electric power is supplied to the accessory **550** via the power line **177**.

Further, the computer system **100***b* cannot perform operations at least partly when no electric power is supplied to any one of the plug sockets (or power lines). For example, the computer system **100***b* cannot display any image on the screen thereof. When the computer system **100***b* cannot display any image on the screen, a user cannot operate the computer system **100***b* directly. In the electric power control system according to the second exemplary embodiment, the printer system **100***a* and the computer system **100***b* perform similar power control processing. In the following description, mainly an operation that can be performed by the printer system **100***a* is described in detail.

FIG. **5** illustrates a configuration example of the MFP **500** and the accessory **550**. The MFP **500** includes a scanner unit **503**, which is functionally operable as an image reading unit configured to read a document placed by a user and generate image data. For example, the scanner unit **503** exposes a document placed on a document positioning glass to a document illumination lamp constituted by a halogen lamp, receives reflection light from the document with a CCD sensor, and outputs an image signal.

The MFP **500** includes a printer unit **504**, which is functionally operable as an image forming unit configured to form an electrostatic latent image by exposing a photosensitive member with light based on image data, develop the formed electrostatic latent image with a developer (toner particles), and print an image on a recording paper by transferring the developed image to the recording paper. The printer unit **504** includes a communication I/F that can communicate with the accessory **550**. The printer unit **504** is connected to the accessory **550** via an accessory communication line **520**. The scanner unit **503** and the printer unit **504** can be configured to have conventionally known configurations and functions. Therefore, detailed description thereof will be avoided.

The MFP **500** includes an operation unit **502**, which is a user interface (UI) that can display information about the MFP on a screen of the liquid crystal display and can detect a user operation that is input via a key switch or a touch panel. The MFP **500** includes an MFP controller unit **501**, which is connected to each of the scanner unit **503**, the printer unit **504**, the operation unit **502**, and an external I/F (e.g., LAN) and is functionally operable as a controller unit configured to control image information and device information.

The MFP **500** includes an alternating current-direct current (AC/DC) power source **505**, which can convert alternating current supplied from the power line **176** into direct current usable in the MFP **500**. The AC/DC power source **505** can be configured to have conventionally known configuration and functions. Therefore, detailed description thereof will be avoided. A communication line **510** is a plug socket detection communication line, which is provided to detect a plug socket into which the insertion plug of the MFP **500** is put. The plug socket detection communication line **510** is described in detail below.

The MFP **500** and the accessory **550** can use the accessory communication line **520** to transmit an operation instruction from the MFP **500** to the accessory **550** and transmit status notification, such as error or staple remaining amount, from the accessory **550** to the MFP **500**. The accessory communication line **520** can be configured to have conventionally known configuration and functions. Therefore, detailed description thereof will be avoided. Further, as mentioned above, the MFP **500** can use the communication line **126** to communicate with the electric power control server **101** and the computer **104**. The communication line **126** is already described. Therefore, detailed description thereof will be avoided.

A configuration example of the accessory **550** will be described in detail below. The accessory **550** includes a paper conveyance unit **553**, which is constituted by a motor and rollers capable of cooperatively conveying a paper and a machine mechanism capable of switching a conveyance path of the paper. The paper conveyance unit **553** is configured to receive a paper printed by the MFP **500** and discharge the paper to the outside of the accessory **550** after being conveyed through the accessory **550**.

The accessory **550** includes a paper processing unit **554**, which can perform various processing (e.g., sorting, stapling, punching, folding, and cutting) on the paper printed by the MFP **500** according to an instruction from the MFP **500**. The paper conveyance unit **553** and the paper processing unit **554** can be configured to have conventionally known configurations and functions. Therefore, detailed description thereof will be avoided.

The accessory **550** includes an accessory controller unit **551**, which can control the paper conveyance unit **553** and the paper processing unit **554** and is connected to the MFP **500** to control image information and device information. The accessory controller unit **551** includes a communication I/F that can communicate with the MFP **500** and is connected to the MFP **500** via the accessory communication line **520**.

The accessory **550** includes an AC/DC power source **555**, which can be configured to have conventionally known configuration and functions. Therefore, detailed description thereof will be avoided. The accessory **550** includes a communication line **560**, which is provided to detect a plug socket into which the insertion plug of the accessory **550** is put. The plug socket detection communication line is described in detail below.

Next, a configuration of the MFP controller unit **501** is described in detail below with reference to FIG. **6**. FIG. **6** illustrates an example of the configuration of the MFP controller unit **501**. In FIG. **6**, a CPU **601** can execute various programs, including control processing routines described below. The CPU **601** is functionally operable as a detection unit, a notification unit, and a power source control unit of a printer system according to the present exemplary embodiment.

The MFP controller unit **501** includes a nonvolatile memory **602** (e.g., ROM or a hard disk). The nonvolatile memory **602** stores a startup program for the CPU **601** and various programs including the control processing routines. The MFP controller unit **501** includes a memory **603** (e.g., RAM), which can be used as a work area when the CPU **601** executes various programs or an image memory that temporarily stores image data.

A network I/F unit (hereinafter, referred to as "NIC") **605** is connected to the LAN and can perform various network controls, including transmission/reception of electronic mails and input/output of PDL data from/to a host computer. The MFP controller unit **501** includes an operation unit I/F **606**, which is an interface (I/F) usable to communicate with the operation unit **502**. The MFP controller unit **501** includes a printer I/F **607**, which is an interface (I/F) connected to the printer unit **504**. For example, the printer I/F **607** performs printer image processing (e.g., printer correction and resolution conversion) on print output image data and transfers print data to the printer unit **504**.

The MFP controller unit **501** includes a scanner I/F **608**, which is an interface (I/F) connected to the scanner unit **503**. For example, the scanner I/F **608** can perform scanner image processing (including correction, modification, editing) on input data received from the scanner unit **503**.

The MFP controller unit **501** includes a plug socket detection unit **609**, which can detect a plug socket into which the insertion plug of the MFP **500** is put. For example, the plug socket detection unit **609** detects the plug socket into which the insertion plug of the MFP **500** is put by reading RFID information provided for the plug socket of the electric power meter **116**. The RFID reading portion can be configured to have conventionally known configuration and functions. Therefore, detailed description thereof will be avoided.

Electric power can be supplied to each unit of the MFP controller unit **501** via a power source line **620**. The above-mentioned units of the MFP controller unit **501** can communicate with each other via a bus **630**.

Next, a configuration of the accessory controller unit **551** is described in detail below with reference to FIG. **7**. FIG. **7** illustrates an example of the configuration of the accessory controller unit **551**. In FIG. **7**, a CPU **701** can execute various programs, including control processing routines described below. The CPU **701** is functionally operable as a notification unit for notifying the accessory configuration according to the present exemplary embodiment by executing the programs and controlling devices and units.

The accessory controller unit **551** includes a nonvolatile memory **702** (e.g., ROM). The nonvolatile memory **702** stores a startup program for the CPU **701** and various programs including control processing routines described below. The accessory controller unit **551** includes a memory **703** (e.g., RAM), which can be used as a work area when the CPU **701** executes various programs.

The accessory controller unit **551** includes a printer I/F unit **705**, which is an interface (I/F) connected to the printer unit **504** of the MFP **500** to control communications to be performed with the MFP **500**. The accessory controller unit **551** includes a paper processing unit I/F **706**, which is an interface (I/F) usable to communicate with the paper processing unit **554**. The accessory controller unit **551** includes a paper conveyance unit I/F **707**, which is an interface (I/F) usable to communicate with the paper conveyance unit **553**.

The accessory controller unit **551** includes a plug socket detection unit **709**, which can detect a plug socket into which the insertion plug of the accessory **550** is put. For example, the plug socket detection unit **709** detects the plug socket into which the insertion plug of the accessory **550** is put by reading RFID information provided for the plug socket of the electric power meter **117**. The RFID reading portion can be configured to have conventionally known configuration and functions. Therefore, detailed description thereof will be avoided.

Electric power can be supplied to each unit of the accessory controller unit **551** via a power source line **720**. The above-mentioned units of the accessory controller unit **551** can communicate with each other via a bus **730**.

Next, operations that can be performed by the printer system **100*a*** and the electric power control server **101** according to the second exemplary embodiment is described in detail below with reference to FIG. **8**. FIG. **8** is a flowchart illustrating an example of the operations that can be performed by the printer system **100*a*** and the electric power control server **101** according to the second exemplary embodiment.

In FIG. **8**, a flowchart **800** illustrates processing that can be executed by the CPU **1201** provided in the electric power control server **101**. A program including the flowchart **800** is stored in the memory **1203**, the nonvolatile memory **1202**, or the storage device **1204** of the electric power control server **101**. Further, a flowchart **801** illustrates processing that can be executed by the CPU **601** of the MFP **500**. A program including the flowchart **801** is stored in the nonvolatile memory **602** or the memory **603** of the MFP **500**. Further, a flowchart **802** illustrates processing that can be executed by the CPU **701** of the accessory **550**. A program including the flowchart **802** is stored in the nonvolatile memory **702** or the memory **703** of the accessory **550**.

First, an operation that can be performed by the accessory **550** step by step is described in detail below with reference to the flowchart **802**. In step S**821**, the accessory **550** detects a plug socket into which the insertion plug of the accessory **550** is put. For example, the plug socket detection unit **709** of the accessory **550** can detect ID information about the plug socket into which the insertion plug of the accessory **550** is put by reading RFID information provided for the electric power meter **117**.

Next, in step S**822**, the accessory **550** notifies the MFP **500** of ID information about the plug socket into which the insertion plug of the accessory **550** is put, which has been detected in the above-mentioned step S**821**, via the communication line **520**. In the present exemplary embodiment, the plug socket ID is plug socket unique ID usable to identify each plug socket (see **903** in FIG. **9**). In the present exemplary embodiment, the data (character string) of the plug socket ID is in a format easy for a user to recognize. However, any other data format (e.g., binary value or alphanumeric data) that can be easily managed by the electric power control server **101** is employable as the data format of the plug socket ID. For example, MAC address or IP address of each electric power meter is usable as the plug socket ID **903** (see FIG. **9**).

In a case where the electric power meter **117** is configured to read the RFID information provided for the insertion plug attached to the distal end of the power line **177** of the accessory **550** as described below, the accessory **550** notifies the MFP **500** of the RFID information about the insertion plug attached to the distal end of the power line **177** of the accessory **550** in the above-mentioned step S**822**. Further, in a case where the MFP **500** is configured to read the RFID information about the power line **177** of the accessory **550**, the above-mentioned processing in step S**822** is unnecessary.

Next, in step S**823**, the accessory **550** determines whether a power shutdown preparatory processing instruction (i.e., "shutdown instruction" described in FIG. **8**) has been received. For example, the accessory **550** waits for a while until a signal or a command indicating the power shutdown preparatory processing instruction is received from the MFP **500**. In the present exemplary embodiment, the accessory **550** is configured to receive the power shutdown preparatory processing instruction from the MFP **500** as described above. However, the present exemplary embodiment can be modified appropriately. For example, the accessory **550** can be configured to receive a preparatory processing instruction for the power shutdown from the electric power control server **101**. If the accessory **550** determines that the preparatory processing instruction for the power shutdown has been received (Yes in step S**823**), the operation proceeds to step S**824**.

Next, in step S**824**, the accessory **550** performs power shutdown preparatory processing (i.e., "shutdown processing" described in FIG. **8**) relating to the accessory **550**. For example, the accessory **550** performs the power shutdown preparatory processing after the discharge operation has been completed in the accessory **550**. In a case where there is a plurality of accessories that are mutually connected, if the accessory **550** receives the power shutdown preparatory processing instruction, the accessory **550** can transmit a preparatory processing instruction for the power shutdown to another accessory that receives the processed paper from the accessory **550** before the accessory **550** starts the power shutdown preparatory processing. In this case, the accessory **550** performs the power shutdown preparatory processing after the discharge operation has been completed in the accessory **550**.

Next, an operation that can be performed by the MFP **500** step by step is described in detail below with reference to the flowchart **801**. In step S**811**, the MFP **500** detects a plug socket into which the insertion plug of the MFP **500** is put. For example, the plug socket detection unit **609** of the MFP **500** can detect ID information about the plug socket into which the insertion plug of the MFP **500** is put by reading RFID information provided for the electric power meter **116**.

Next, in step S**812**, the MFP **500** receives the ID information about the plug socket into which the insertion plug of the accessory **550** is put. For example, the MFP **500** receives the plug socket ID from the accessory **550** via the communication line **520**. In this case, the MFP **500** can obtain RFID information about the power line **177** of the accessory **550** that can be directly read by the plug socket detection unit **609** of the MFP **500**.

Next, in step S**813**, the MFP **500** notifies the electric power control server **101** of the ID information about the plug sockets into which the insertion plugs of the MFP **500** and the accessory **550** are put via the communication line **126**. The plug socket ID is described in detail in FIG. **9** (see **903**). In a case where the electric power meters **116** and **117** are configured to read RFID information about the insertion plugs of the MFP **500** and the accessory **550** as described below, the above-mentioned processing in steps S**811**, S**812**, and S**813** is unnecessary.

Next, in step S**814**, for example, the MFP **500** notifies the electric power control server **101** of information about the device configuration of the printer system **100***a*. The information about the device configuration of the printer system **100***a* is information identifying a device that requires electric power to enable the printer system **100***a* to operate normally. The information about the device configuration of the printer system **100***a* includes information about a combination of the MFP **500** and the accessory **550** to be subjected to the power shutdown processing. For example, in step S**814**, the MFP **500** transmits IP address about the MFP **500**.

First, the MFP **500** transmits IP address information about the accessory **550** (i.e., the device to be subjected to the power source control together with the MFP **500**). In the present exemplary embodiment, the processing to be performed by the MFP **500** in step S**814** is transmitting IP addresses of the MFP **500** and the accessory **550** for illustrative purposes. Alternatively, the MFP **500** can transmit identification information (e.g., MAC address) about each of the MFP **500** and the accessory **550**. In the present exemplary embodiment, the power shutdown processing is performed simultaneously for the MFP **500** and the accessory **550**. However, in a case where the power shutdown (power shutdown preparatory) processing is differentiated for each of the MFP **500** and the accessory **550**, the above-mentioned information about the device configuration of the printer system **100***a* can include the information about the differentiation (e.g., order or time difference).

Next, in step S**815**, the MFP **500** determines whether a power shutdown preparatory processing instruction (i.e., "shutdown instruction") has been received. For example, the MFP **500** waits for a while until a signal or a command indicating the preparatory processing instruction for the power shutdown is received from the electric power control server **101** via the communication line **126**. The processing to be performed in step S**815** is similar to the processing performed in step S**213** and therefore detailed description thereof will be avoided. If the MFP **500** determines that the preparatory processing instruction for the power shutdown has been received (Yes in step S**815**), the operation proceeds to step S**816**.

Next, in step S**816**, the MFP **500** transmits a preparatory processing instruction for power shutdown (i.e., "shutdown instruction") to the accessory **550**. For example, the MFP **500** transmits a signal or a command indicating the preparatory processing instruction for the power shutdown to the accessory **550** via the communication line **520**. If the MFP **500** starts the power shutdown preparatory processing, the printer system **100***a* cannot operate normally even when electric power is continuously supplied to the accessory **550**. Therefore, if the MFP **500** receives the preparatory processing instruction for the power shutdown directed to the MFP **500**, the MFP **500** transmits the preparatory processing instruction for the power shutdown to the accessory **550**.

Next, in step S**817**, the MFP **500** transmits a notification to the electric power control server **101** via the communication line **126** to inform that the preparatory processing instruction for the power shutdown has been transmitted to the accessory **550**. The MFP **500** can notify the electric power control server **101** of completion time of the power shutdown preparatory processing (i.e., "shutdown processing") performed in each of the MFP **500** and the accessory **550**.

Next, in step S**818**, the MFP **500** performs power shutdown preparatory processing (i.e., "shutdown processing") relating to the MFP **500**. For example, the power shutdown preparatory processing to be performed by the MFP **500** is saving the contents of the memory **603** in a nonvolatile memory (e.g., a hard disk). Further, the power shutdown preparatory processing includes interrupting the print processing of the MFP **500**, discharging papers from the printer unit **504** of the MFP **500**, and cooling a fixing heater of the printer unit **504**. The power shutdown preparatory processing can be realized by a conventionally known printer that has a general configuration and performs general processing. Therefore, detailed description thereof will be avoided.

Next, an operation to be performed by the electric power control server **101** is described in detail below with reference to the flowchart **800**. In step S**801**, the electric power control server **101** detects plug sockets into which insertion plugs of the MFP **500** and the accessory **550** are put. In the present exemplary embodiment, the electric power control server **101** receives the plug socket ID information about each of the MFP **500** and the accessory **550** transmitted in the step S**813**.

Although the MFP **500** or the accessory **550** is configured to read RFID information about the electric power meters **116** and **117** and the electric power control server **101** receives the plug socket ID information transmitted from the MFP **500** or the accessory **550**, the system configuration is not limited to the above-mentioned example.

For example, the electric power meters **116** and **117** can be configured to read RFID information about the power lines **176** and **177** of the MFP **500** and the accessory **550** and transmit the read RFID information to the electric power control server **101**, so that the electric power control server **101** can detect ID information about the plug sockets into which the insertion plugs of the MFP **500** and the accessory **550** are put.

Next, in step S**802**, the electric power control server **101** receives the information about the device configuration of the printer system **100***a* from the MFP **500**. The information about the device configuration of the printer system **100***a* is information identifying a device that requires electric power to enable the printer system **100***a* to operate normally. The information about the device configuration of the printer system **100***a* includes information about a combination of the MFP **500** and the accessory **550** to be subjected to the power shutdown processing.

For example, the information identifying the device that requires electric power is device unique information (e.g., IP address or MAC address) about the MFP **500** and the accessory **550**. Based on the received configuration information, the electric power control server **101** generates a power source management table (e.g., as illustrated in FIG. **9**) that can be used to manage the device unique information (e.g., IP address or MAC address) about the electric power meters connected to the MFP **500** and the accessory **550**. The power source management table is described in detail below.

Next, in step S**803**, the electric power control server **101** determines whether the electric power is in a tight state with respect to the power source systems (i.e., the power lines **130**, **140**, and **150**) of the electric power control server **101**, the MFP **500**, and the accessory **550** with reference to the above-mentioned power source management table.

The processing to be performed in step S**803** is similar to the processing performed in step S**202** illustrated in FIG. **2** and therefore detailed description thereof will be avoided. If it is determined that the electric power is not tight (No in step

S**803**), the electric power control server **101** repeats the determination processing in step S**803**. On the other hand, if it is determined that the electric power is tight (Yes in step S**803**), the operation of the electric power control server **101** proceeds to step S**804**.

In step S**804**, the electric power control server **101** instructs the printer system **100***a* (i.e., the device connected to the power line whose electric power is tight) to perform power shutdown preparatory processing. For example, when the electric power of the power line **150** is tight, the electric power control server **101** instructs the MFP **500** (i.e., the device connected to the power line **150**) to perform power shutdown preparatory processing, with reference to the power source management table described below. Further, the electric power control server **101** may instruct the accessory **550** (i.e., the device that constitutes the printer system **100***a* together with the MFP **500**) to perform power shutdown preparatory processing, with reference to the power source management table described below.

In the present exemplary embodiment, for illustrative purposes, the electric power control server **101** sequentially transmits the preparatory processing instructions for the power shutdown to the MFP **500** and the accessory **550** in this order. However, any modification is acceptable if the MFP **500** and the accessory **550** can prepare for the power shutdown processing. However, for example, as a modified embodiment, the electric power control server **101** can simultaneously transmit the preparatory processing instruction for the power shutdown to both of the MFP **500** and the accessory **550**.

Alternatively, the electric power control server **101** can sequentially transmit the power shutdown preparatory processing instructions to the accessory **550** and the MFP **500** in this order. Further, the electric power control server **101** can transmit the preparatory processing instruction for the power shutdown to either the MFP **500** or the accessory **550**. Further, the electric power control server **101** can transmit an electric power shutdown notification, instead of transmitting the preparatory processing instruction for the power shutdown.

Next, in step S**805**, the electric power control server **101** determines whether the power shutdown preparatory processing has been completed in the printer system **100***a*. For example, the electric power control server **101** can be configured to receive a notification relating to completion time of the power shutdown preparatory processing in the MFP **500** and the accessory **550** in a case where the electric power control server **101** has instructed the MFP **500** to perform the power shutdown preparatory processing in the above-mentioned step S**804**.

Further, in determining whether the device connected to the power line whose electric power is tight (i.e., the MFP **500** or the accessory **550** in the present exemplary embodiment) has shut down, the electric power control server **101** can communicate with an output meter connected to the device to monitor the electric power consumption and can determine that the shutdown processing has been completed when the electric power consumption reaches a predetermined value (i.e., a power consumption value in a shutdown completion state).

The power consumption value in the shutdown completion state of each device can be registered beforehand in the electric power control server **101** or can be acquired in the above-mentioned step S**201**.

Further, in a case where the above-mentioned information about the device configuration acquired in step S**802** includes time required for the device to complete the shutdown processing, the electric power control server **101** can determine that the shutdown processing of the device has been completed when the time has elapsed. The time required for each device to complete the shutdown processing can be registered beforehand in the electric power control server **101**. Further, after transmitting the shutdown instruction in the above-mentioned step S**804**, the electric power control server **101** can receive the completion time of the power shutdown preparatory processing (i.e., "shutdown processing") in the MFP **500** or the accessory **550** from the MFP **500**.

If the electric power control server **101** determines that the power shutdown preparatory processing is not yet completed in the apparatus system **100** connected to the power line whose electric power is tight (No in step S**805**), the electric power control server **101** repeats the determination processing in step S**805**. On the other hand, if the electric power control server **101** determines that the power shutdown preparatory processing has been completed in the apparatus system **100** connected to the power line whose electric power is tight (Yes in step S**805**), the operation proceeds to step S**806**.

Next, in step S**806**, the electric power control server **101** instructs the electric power meter connected to the device determined in the above-mentioned step S**805** as having completed the power shutdown preparatory processing to stop the electric power supply operation (turn off the breaker of the plug socket illustrated in FIG. **8**). The configuration and processing for stopping the electric power supply operation is similar to those described in step S**205** and therefore detailed description thereof will be avoided.

Next, the power source management table employable for the electric power control system according to the second exemplary embodiment is described in detail below with reference to FIG. **9**. FIG. **9** illustrates an example of the power source management table that indicates power lines to which the printer system **100***a* and the computer system **100***b* illustrated in FIG. **4** are connected, communication destinations of the printer system **100***a* and the computer system **100***b*, and a relationship between constituent devices of the printer system **100***a* and the computer system **100***b* to be subjected to the power source shutdown processing.

The power source management table is stored in the memory **1203** or the storage device **1204** of the electric power control server **101**. Further, the power source management table illustrated in FIG. **3** can be generated in step S**801** or step S**802** illustrated in FIG. **8** (i.e., by the processing to be performed by the CPU **1201** provided in the electric power control server **101**) and can be referred to in step S**803**, step S**804**, step S**805**, step S**806**. Data (character string) of FIG. **8** is in a format easy for a user to recognize. However, any other data format (e.g., binary value or alphanumeric data) that can be easily managed by the electric power control server **101** is employable as the data format of FIG. **8**.

In FIG. **9**, a data string **901** indicates device name of each device (i.e., each of the MFP **500** and the accessory **550**). The device name **901** is similar to the device name **301** illustrated in FIG. **3** and therefore detailed description thereof will be avoided. A data string **902** indicates power source system (power line) to which each device of the device name **301** is connected. The power source system (power line) **902** is similar to the power source system (power line) **302** illustrated in FIG. **3** and therefore detailed description thereof will be avoided.

A data string **903** indicates plug socket ID usable to identify a plug socket and an electric power meter to which each device of the device name **901** is connected. The plug socket ID **903** is information differentiated for each plug socket to uniquely identify the plug socket and the electric power meter. The value detected in step S**801** of the flowchart illustrated in FIG. **8** or ID information about the RFID provided for each electric power meter can be stored as the plug socket ID **903**.

In a case where RFID information is referred to in detecting the plug socket IDs of the plug sockets into which the insertion plugs of the MFP **500** and the accessory **550** are put, RFID values notified from the MFP **500** and the accessory **550** are stored as the plug socket ID **903** in respective lines corresponding to the MFP **500** and the accessory **550**. Alternatively, the plug socket ID **903** can be similar to the plug socket ID **303** illustrated in FIG. **3**. In this case, detailed description thereof will be avoided.

A data string **904** indicates communication destination of an electric power meter to which each device of the device name **901** is connected. The communication destination **904** is similar to the communication destination **304** illustrated in FIG. **3** and therefore detailed description thereof will be avoided. A data string **905** indicates communication destination of each device of the device name **901**. The communication destination **905** is similar to the communication destination **305** illustrated in FIG. **3** and therefore detailed description thereof will be avoided. A data string **906** indicates a device that constitutes the apparatus system together with the device of the device name **901**. The data **906** is similar to the data **306** illustrated in FIG. **3** and therefore detailed description thereof will be avoided.

The power source management table illustrated in FIG. **9** includes information relating to the printer system **100***a* described in a data row **910**. More specifically, information relating to the MFP **500** is described in an upper part of the data row **910** and information relating to the accessory **550** is described in a lower part of the data row **910**. Further, the power source management table illustrated in FIG. **9** includes information relating to the computer system **100***b* described in data row **911**. More specifically, information relating to the PC **104** is described in an upper part of the data row **911** and information relating to the display device **105** is described in a lower part of the data row **911**.

Next, examples of the electric power meter are described in detail below with reference to FIGS. **10** and **11**. FIG. **10** illustrates a configuration example of the electric power meters **111**, **112**, **113**, **114**, **115**, **116**, and **117** illustrated in FIGS. **1** and **4**. An electric power meter **1000** illustrated in FIG. **10** is connected with an insertion plug **1050**. The insertion plug **1050** is attached to a distal end of a power line connected to the electric power meter **1000**. Electric power can be supplied from the electric power meter **1000** to each device (such as the MFP **500** or the accessory **550**) via the insertion plug **1050**.

The electric power meter **1000** has the following internal configuration. Electric power can be supplied to the insertion plug **1050** when the insertion plug **1050** is put into a socket insertion port **1001** of the electric power meter **1000**. A measurement unit **1002** is configured to measure voltage/current, electric power, or electric power amount of the socket insertion port **1001** and can notify a control unit **1010** of a measurement result.

The switch **1003** is configured to selectively start or stop electric power supply to the socket insertion port **1001** in accordance with an instruction from the control unit **1010**. A power line **1004** corresponds to the power lines **131**, **143**, **152**, **134**, **135**, **147**, and **156** illustrated in FIGS. **1** and **4**.

In the electric power meter **1000**, the control unit **1010** can receive the measurement result from the measurement unit **1002** and cause the switch **1003** to perform the above-mentioned switching operation and further can communicate with the electric power control server **101** via an external I/F **1011**.

The external I/F **1011** is connectable to a communication line of Ethernet (registered trademark) type. In the present exemplary embodiment, the external I/F **1011** is not limited to the Ethernet (registered trademark) type and can be a wired communication type, such as RS-232 or Power Line Communication (PLC). Further, the external I/F **1011** can be a wireless communication type, such as wireless LAN, Bluetooth (registered trademark), ZigBee (registered trademark), or RFID. An IC tag **1012** (e.g., RFID) is provided to identify the plug socket ID. The electric power meter **1000** has the above-mentioned internal configuration.

The insertion plug **1050** has the following internal configuration. Electric power can be supplied when a socket insertion portion **1051** is put into the socket insertion port **1001**. A power line **1052** corresponds to the power lines **171**, **172**, **173**, **174**, **175**, **176**, and **177** illustrated in FIGS. **1** and **4**.

An IC (e.g., RFID) tag reading unit **1053** can read plug socket ID stored in the IC tag **1012** of the electric power meter **1000**. A plug socket ID communication line **1054** corresponds to the communication lines **510** and **560** illustrated in FIG. **5**. To read the plug socket ID, the IC tag reading unit **1053** communicates with the plug socket detection unit **609** illustrated in FIG. **6** or the plug socket detection unit **709** illustrated in FIG. **7**. The insertion plug **1050** has the above-mentioned internal configuration.

Next, another configuration of the electric power meter is described in detail below with reference to FIG. **11**. FIG. **11** illustrates another configuration example of the electric power meters **111**, **112**, **113**, **114**, **115**, **116**, and **117** illustrated in FIGS. **1** and **4**. Differences between FIG. **11** and FIG. **10** are described in detail below.

In FIG. **11**, an IC tag **1101** is RFID usable to identify the plug socket ID. An IC tag (e.g., RFID) reading unit **1102** is capable of reading ID information stored in the IC tag **1101** of the insertion plug **1050**. The IC tag reading unit **1102** can notify the control unit **1010** of the read ID information. The control unit **1010** notifies the electric power control server **101** of the read ID information via the external I/F **1011**.

In each of the above-mentioned exemplary embodiments, if the electric power of a specific power source system is tight, the electric power control system performs a shutdown operation in such a way as to stop the electric power supply to another cooperative load in addition to a load connected to the power source system whose electric power is tight.

However, the present invention is applicable to any other case where the electric power to be supplied to a device system should be shut down at least partly. For example, if the electric power control system receives a shutdown instruction directed to a partial load, the electric power control system can perform a shutdown operation in such a way as to stop the electric power supply to a system constituted by the above-mentioned partial load and another cooperative load.

As mentioned above, the electric power control system having the configuration illustrated in FIG. **4** can manage the power source by performing the processing of the flowchart illustrated in FIG. **8**. In this case, the system can perform a shutdown operation in such a way as to completely stop the electric power supply to the apparatus system **100***a* having a plurality of plug sockets, with reference to the power source management table illustrated in FIG. **9**.

As a result, in a case where the apparatus system **100***a* cannot perform operations normally, the electric power control system can prevent electric power from being continuously supplied to the electric power loads (e.g., the MFP **500** and the accessory **550**) of the apparatus system **100***a*. In other words, the system can eliminate useless consumption of the electric power. Using the electric power meter illustrated in

FIG. **10** or FIG. **11** is advantageous in that each plug socket can be automatically associated with a corresponding device and in that a work for constituting the electric power control system becomes easy.

As another embodiment, the printer system **100***a* may include a plurality of accessories connected to the MFP **500**. Even in such a case, the system according to the present invention can perform similar electric power control for the remaining accessories (other than the accessory **550**).

Further, in a case where a printer system is connected a print server that generates a print job for the MFP **500**, the print server can perform processing similar to the above-mention processing performed by the MFP **500**. The present invention can be applied to any printer system that includes or cooperates with a print server.

Further, the electric power loads applicable to the flowchart illustrated in FIG. **8** are not limited to the MFP **500** and the accessory **550**. For example, the MFP **500** can be replaced by the PC **104** and the accessory **550** can be replaced by the display device **105**. The electric power control according to the present exemplary embodiment can be realized similarly. More specifically, the present invention is applicable not only to the printer system **100***a* but also to the computer system **100***b*. In this case, the present invention is applicable to any other system including a plurality of power sources.

Further, in the above-mentioned exemplary embodiments, the electric power control server **101** is configured to receive the configuration information from a device that constitutes each apparatus configuration system as described above. However, as another exemplary embodiment, the electric power control server **101** can be configured to request a device of each apparatus configuration system to transmit the configuration information about each apparatus system.

As mentioned above, in an apparatus system including a plurality of devices, the apparatus system may not be able to operate normally if the electric power supply to any one of the devices is stopped. In such a case, the electric power control system according to the present invention stops also the electric power supply to the remaining device in the apparatus system to reduce an amount of electric power being uselessly consumed. Accordingly, the electric power control system according to the present invention can prevent electric power from being uselessly consumed in a state where the apparatus system cannot operate normally. More specifically, the electric power control system according to the present invention can reduce the amount of uselessly consumed electric power in a state where the electric power may be continuously supplied to at least a part of devices cooperatively constituting a device group.

As described above, the present invention provides an electric power control system that can measure an electric power amount and can perform a shutdown operation in such a way as to shut a part of power lines if the measured electric power amount is inappropriate. For example, the present invention is applicable to a printing apparatus, such as a printer, a digital copying machine, a digital multifunction peripheral, or a facsimile apparatus. Further, the present invention is applicable to a printing system including an accessory (e.g., a paper finisher), which is connected to a power line different from that of a printing apparatus, or a print server that generates print image data.

The configuration and contents of various data are not limited to the above-mentioned examples and therefore can be modified in various ways according to the way of usage or purposes. The present invention is not limited to some exemplary embodiments having been described above. For example, the present invention can be realized as a system, an apparatus, a method, a program, or a storage medium. More specifically, the present invention can be applied to a system including a plurality of devices or can be applied to an apparatus constituted by a single device. Further, the present invention encompasses any configuration obtainable by combining two or more exemplary embodiments described above.

(Another Exemplary Embodiment)

Further, the present invention can be realized by performing the following processing. More specifically, the processing includes supplying a software program that can realize the functions of the above-mentioned exemplary embodiments to a system or an apparatus via a network or an appropriate storage medium and causing a computer (or CPU or a micro processing unit (MPU)) of the system or the apparatus to read and execute the program. Further, the present invention can be applied to a system including a plurality of devices or can be applied to an apparatus constituted by a single device.

The present invention is not limited to the above-mentioned exemplary embodiments and can be modified in various ways (e.g., an appropriate combination of two or more exemplary embodiments) within the scope of the invention. The present invention encompasses any possible modifications within the scope of the present invention. The present invention encompasses any possible combinations obtainable based on the above-mentioned exemplary embodiments and modified embodiments thereof.

According to the present invention, the electric power control system can prevent electric power from being continuously supplied to a part of devices that constitute an apparatus system in a state where the apparatus system cannot perform operations normally, thereby reducing an amount of uselessly consumed electric power.

Other Embodiments

Embodiments of the present invention can also be realized by a computer of a system or apparatus that reads out and executes computer executable instructions recorded on a storage medium (e.g., non-transitory computer-readable storage medium) to perform the functions of one or more of the above-described embodiment(s) of the present invention, and by a method performed by the computer of the system or apparatus by, for example, reading out and executing the computer executable instructions from the storage medium to perform the functions of one or more of the above-described embodiment(s). The computer may comprise one or more of a central processing unit (CPU), micro processing unit (MPU), or other circuitry, and may include a network of separate computers or separate computer processors. The computer executable instructions may be provided to the computer, for example, from a network or the storage medium. The storage medium may include, for example, one or more of a hard disk, a random-access memory (RAM), a read only memory (ROM), a storage of distributed computing systems, an optical disk (such as a compact disc (CD), digital versatile disc (DVD), or Blu-ray Disc (BD)™), a flash memory device, a memory card, and the like.

While the present invention has been described with reference to exemplary embodiments, it is to be understood that the invention is not limited to the disclosed exemplary embodiments. The scope of the following claims is to be accorded the broadest interpretation so as to encompass all such modifications and equivalent structures and functions.

This application claims the benefit of Japanese Patent Application No. 2013-260811 filed Dec. 18, 2013, which is hereby incorporated by reference herein in its entirety.

What is claimed is:

1. An electric power control system comprising:

a first device configured to perform an operation when electric power is supplied via a first plug socket;

a second device configured to perform an operation when electric power is supplied via a second plug socket, wherein the first device and the second device are connected in such a way as to communicate with each other; and

an electric power control apparatus configured to control the electric power to be supplied to the first device and the second device,

wherein the first device includes a notification unit configured to notify the electric power control apparatus of information indicating the second device that is a device relating to the first device, and

wherein the electric power control apparatus includes an electric power control unit configured to stop supplying electric power to the second device based on the information notified from the notification unit when the electric power control unit stops supplying electric power to the first device.

2. The electric power control system according to claim **1**, wherein the electric power control unit is configured to instruct the first device to perform a shutdown operation before the electric power control unit stops supplying electric power to the first device and the second device.

3. The electric power control system according to claim **2**, wherein, in a case where a predetermined time has elapsed after instructing the first device to perform the shutdown operation, the electric power control unit is configured to stop supplying electric power to the first device and the second device.

4. The electric power control system according to claim **2**, wherein the electric power control unit is configured to monitor electric power consumption of the first device or the second device and, in a case where the monitored electric power consumption is equal to or less than a predetermined electric power consumption, stop supplying electric power to the first device and the second device.

5. The electric power control system according to claim **1**, wherein the first device includes:

a reception unit configured to receive the instruction,

an execution unit configured to cause the first device to perform the shutdown operation in response to the instruction received by the reception unit, and

an instruction unit configured to instruct the second device to perform a shutdown operation in response to the instruction received by the reception unit.

6. The electric power control system according to claim **5**, wherein the electric power control unit is configured to stop supplying electric power to the first device and the second device after both the first device and the second device have completed the shutdown operation.

7. The electric power control system according to claim **1**, wherein the notification unit of the first device is configured to notify the electric power control apparatus of configuration information about a device system including the first device and the second device, and the electric power control apparatus is configured to determine a target power supply device based on the device system configuration information received from the notification unit.

8. The electric power control system according to claim **1**, wherein the first device is an image forming apparatus that forms an image on a paper, and the second device is a post-processing apparatus that performs post-processing on the paper on which the image has been formed by the image forming apparatus.

9. The electric power control system according to claim **1**, wherein the first device is a print server that receives a print request from an external apparatus, and the second device is an image forming apparatus that forms an image on a paper based on image data transmitted from the print server.

10. An electric power control apparatus that can communicate with a first device configured to perform an operation when electric power is supplied via a first plug socket and a second device configured to perform an operation when electric power is supplied via a second plug socket, wherein the first device and the second device are connected in such a way as to communicate with each other, the electric power control apparatus comprising:

a reception unit configured to receive, from the first device, information indicating the second device that is a device relating to the first device;

a first instruction unit configured to generate an instruction to stop supplying electric power to the first device;

a second instruction unit configured to generate an instruction to stop supplying electric power to the second device,

wherein, in a case where the first instruction unit generates the instruction to stop supplying electric power to the first device, the second instruction unit generates the instruction to stop supplying electric power to the second device based on the information received from the reception unit.

11. The electric power control apparatus according to claim **10**, further comprising:

a shutdown instruction unit configured to instruct the first device to perform a shutdown operation before the electric power supply to the first device and the second device is stopped.

12. The electric power control apparatus according to claim **10**, wherein the first instruction unit is configured to generate an instruction to stop supplying electric power to the first device after the first device completes the shutdown operation, and the second instruction unit is configured to generate an instruction to stop supplying electric power to the second device after the second device completes the shutdown operation.

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